

ENGINEERING TRIPOS PART IIB

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Wednesday 26 April 2006 2.30 to 4.00

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Module 4A3

TURBOMACHINERY I

*Answer not more than two questions.*

*All questions carry the same number of marks.*

*The **approximate** percentage of marks allocated to each part of a question is indicated in the right margin.*

*Attachment:- Compressible Flow Data Book (38 pages).*

STATIONERY  
Single-sided script paper

SPECIAL REQUIREMENTS  
Engineering Data Book  
CUED approved calculator allowed

**You may not start to read the questions printed on the subsequent pages of this question paper until instructed that you may do so by the Invigilator**

- 1 (a) Derive the relationship

$$\psi = 2(1 - \Lambda - \phi \tan \alpha_1)$$

relating the stage loading coefficient  $\psi$ , the reaction  $\Lambda$ , the flow coefficient  $\phi$  and the interstage swirl  $\alpha_1$  of an axial flow turbine with repeating stages. [30%]

- (b) A 20% reaction high-pressure steam turbine stage has a loading coefficient of 1.85 at a flow coefficient of 0.35. Find the absolute and relative flow angles at inlet and outlet to the stator and rotor and sketch the velocity triangles at these locations. [25%]

- (c) The total-to-total efficiency of the stage can be estimated from

$$\eta_{tt} = 1 - 0.04 \frac{V_2^2 + W_3^2}{\Delta h_0} .$$

Estimate the total-to-total and the total-to-static efficiency of this stage design. [20%]

- (d) Describe the features which make low reaction stages attractive to some steam turbine manufacturers. [25%]

- 2 (a) Using a clearly labelled sketch, describe how the radial velocity profile in the rotor passage of a centrifugal impeller varies with increasing radius and what physical phenomena are responsible for these changes. In your answer, you should include discussion of the region close to the trailing edge. [20%]
- (b) A centrifugal compressor is designed with  $40^\circ$  backswept blades and a radial velocity to blade speed ratio at impeller exit of 0.3 . Air enters the compressor axially at a rate of  $0.62 \text{ kg s}^{-1}$  at a stagnation temperature of 300 K and a stagnation pressure of 100 kPa. At design flow the stagnation pressure ratio across the impeller is 3, the slip factor is 0.9 and the total-to-total polytropic efficiency is 0.93 . Determine the stagnation temperature at impeller exit. [15%]
- (c) Determine the blade speed at impeller exit and the absolute and relative flow velocities there. Sketch the velocity triangle at this location. [25%]
- (d) If the impeller tip radius is 40 mm at inlet and 75 mm at exit, find the axial width of the impeller at exit and the inlet hub-to-tip ratio necessary to keep the inlet Mach number at 0.4 . [20%]
- (e) Explain why centrifugal compressors can generally operate with higher pressure coefficients than single stage axial machines. [20%]

(TURN OVER



- 3 (a) Show that the propulsive efficiency of an aircraft can be written as

$$\eta_p = \frac{(1+F)V_j V - V^2}{\frac{1}{2}(1+F)V_j^2 - \frac{1}{2}V^2}$$

where  $V$  is the velocity of the aircraft,  $V_j$  is the jet velocity and  $F$  is the ratio of fuel to air mass flow rates. Explain the physical meaning of the terms in the numerator and denominator. If the fuel mass flow rate can be considered small relative to the air mass flow rate, use the above equation to derive the Froude equation for propulsive efficiency. [20%]

(b) The fan of a turbofan engine is designed for an aircraft that cruises at Mach 0.85 at a height of 10000 m. The ambient pressure at this height is 26.5 kPa and the ambient temperature is 223.3 K. The fan pressure ratio is 1.5 and its total-to-total polytropic efficiency is 0.9. If the flow in the exit nozzle may be considered isentropic, calculate the velocity of the jet from the fan  $V_{jfan}$  and the propulsive efficiency of the aircraft  $\eta_p$  assuming that the velocity of the jet from the core is the same as that from the fan. [35%]

(c) The fan described in Part (b) is powered directly by the low-pressure turbine. The bypass ratio of the engine is 10 and the flow through the nozzle can be considered isentropic. Take  $\gamma = 1.3$  and  $c_p = 1250 \text{ J kg}^{-1}\text{K}^{-1}$  for the products of combustion.

- (i) Calculate the temperature drop across the low-pressure turbine. [10%]

(ii) If the total-to-total polytropic efficiency of the low-pressure turbine is 0.8 and the stagnation pressure and temperature at entry to the turbine are 290 kPa and 1050 K, calculate the ratio of the bypass jet velocity to the core jet velocity,  $V_{jfan} / V_{jcore}$ . [20%]

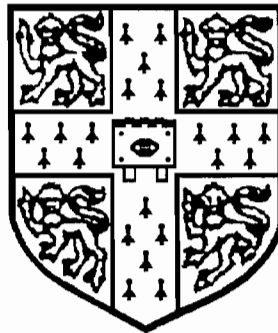
(iii) Describe how you would modify the equation for  $\eta_p$  to account for different core and fan jet velocities. [15%]

**END OF PAPER**

# Compressible Flow Data Book

for Part II of the  
Engineering Tripos

**2004 Edition**



Cambridge University Engineering Department

# PERFECT GAS RELATIONS FOR COMPRESSIBLE FLOW

## Ratios of stagnation to static quantities

$$\frac{T}{T_0} = \left(1 + \frac{\gamma-1}{2} M^2\right)^{-1}$$

$$\frac{p}{p_0} = \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{\gamma}{\gamma-1}}$$

$$\frac{\rho}{\rho_0} = \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{\gamma-1}}$$

Notes:

(1)  $T_0 = \text{const.}$  in adiabatic flow with no shaft work

(2) If flow is isentropic,  $p_0 = \text{const.}$  and  $\rho_0 = \text{const.}$  when  $T_0 = \text{const.}$

## Mach number relations (see tables)

$$\frac{V}{\sqrt{c_p T_0}} = \sqrt{\gamma-1} M \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{2}}$$

$$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0} = \frac{\gamma}{\sqrt{\gamma-1}} M \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{2} \left(\frac{\gamma+1}{\gamma-1}\right)}$$

$$\frac{\dot{m} \sqrt{c_p T_0}}{A p} = \frac{\gamma}{\sqrt{\gamma-1}} M \left(1 + \frac{\gamma-1}{2} M^2\right)^{\frac{1}{2}}$$

$$\frac{F}{\dot{m} \sqrt{c_p T_0}} = \frac{\sqrt{\gamma-1}}{\gamma} \frac{1 + \gamma M^2}{M} \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{1}{2}} \quad \text{where } F = (p + \rho V^2) A$$

$$\frac{\frac{1}{2} \rho V^2}{p_0} = \frac{1}{2} \gamma M^2 \left(1 + \frac{\gamma-1}{2} M^2\right)^{-\frac{\gamma}{\gamma-1}}$$

# ONE-DIMENSIONAL FLOW OF A PERFECT GAS

## Isentropic flow

$$\frac{A}{A^*} = \frac{1}{M} \left\{ \frac{2}{\gamma+1} \left( 1 + \frac{\gamma-1}{2} M^2 \right) \right\}^{\frac{1}{2} \left( \frac{\gamma+1}{\gamma-1} \right)}$$

## Adiabatic constant area flow

$$\frac{4c_f L_{\max}}{D} = \frac{1-M^2}{\gamma M^2} + \frac{\gamma+1}{2\gamma} \ln \left( \frac{(\gamma+1)M^2}{2 \left( 1 + \frac{\gamma-1}{2} M^2 \right)} \right)$$

## Normal shock waves in perfect gases

$$VV_s = a^{*2}$$

$$M_s = \left( \frac{1 + \frac{\gamma-1}{2} M^2}{\gamma M^2 - \frac{\gamma-1}{2}} \right)^{\frac{1}{2}}$$

$$\frac{p_{0s}}{p_0} = \left( \frac{\frac{\gamma+1}{2} M^2}{1 + \frac{\gamma-1}{2} M^2} \right)^{\frac{\gamma}{\gamma-1}} \left( \frac{2\gamma}{\gamma+1} M^2 - \frac{\gamma-1}{\gamma+1} \right)^{\frac{1}{1-\gamma}}$$

$$\frac{p_s}{p} = 1 + \frac{2\gamma}{\gamma+1} (M^2 - 1)$$

$$\frac{p_{0s}}{p} = \left( \frac{\gamma+1}{2} M^2 \right)^{\frac{\gamma}{\gamma-1}} \left( \frac{2\gamma}{\gamma+1} M^2 - \frac{\gamma-1}{\gamma+1} \right)^{\frac{1}{1-\gamma}}$$

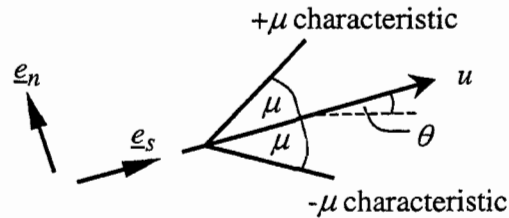
$$\frac{T_s}{T} = \frac{\gamma-1}{(\gamma+1)^2} \frac{2}{M^2} \left( 1 + \frac{\gamma-1}{2} M^2 \right) \left( \frac{2\gamma}{\gamma-1} M^2 - 1 \right)$$

$$\frac{\rho_s}{\rho} = \frac{(\gamma+1)M^2}{2 \left( 1 + \frac{\gamma-1}{2} M^2 \right)}$$

# TWO DIMENSIONAL SUPERSONIC FLOW

## Method of Characteristics for 2-D supersonic flow

Applicable to adiabatic ( $h_0 = \text{constant}$ ), isentropic flow



**Mach Number**

$$M = u/c$$

**Mach angle**

$$\mu = \sin^{-1}\left(\frac{1}{M}\right)$$

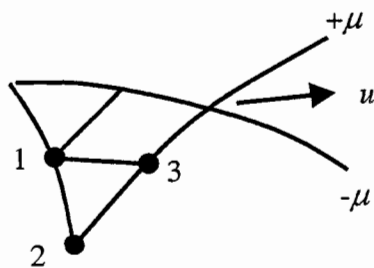
**Prandtl-Meyer function**

$$v = \int_1^M \sqrt{M^2 - 1} \frac{du}{u}$$

$$v = \sqrt{\frac{\gamma+1}{\gamma-1}} \tan^{-1} \sqrt{\frac{\gamma-1}{\gamma+1} (M^2 - 1)} - \tan^{-1} \sqrt{M^2 - 1} \quad \text{for a perfect gas}$$

### Calculations

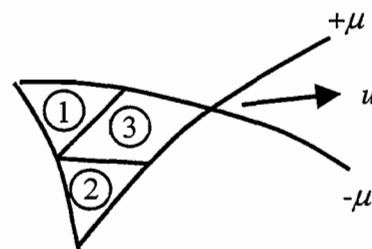
Lattice Method



$$v_3 - \theta_3 = v_2 - \theta_2 \quad \text{along } +\mu$$

$$v_3 + \theta_3 = v_1 + \theta_1 \quad \text{along } -\mu$$

Field (or wave) method

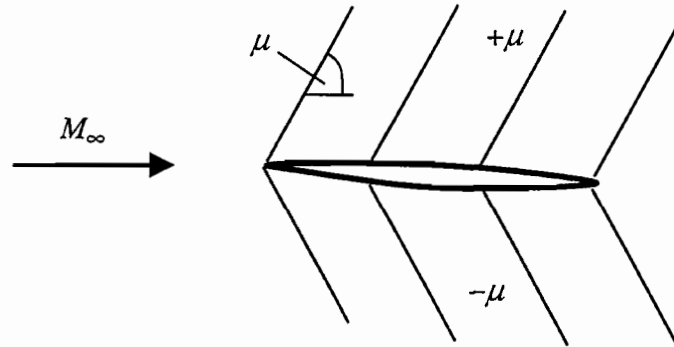


$$v_3 + \theta_3 = v_1 + \theta_1 \quad \text{across } +\mu$$

$$v_3 - \theta_3 = v_2 - \theta_2 \quad \text{across } -\mu$$



**Linearised Method of Characteristics (thin film theory)**

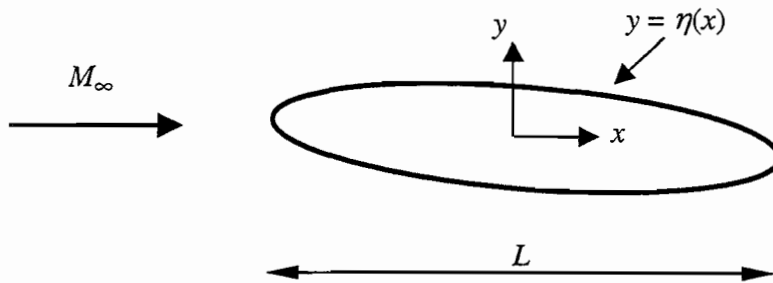


$$\mu \approx \sin^{-1}(1/M_\infty)$$

$$\Delta p \approx \pm \frac{\rho_\infty u_\infty^2 \Delta \theta}{\sqrt{M_\infty^2 - 1}} \quad \text{across } \pm \mu \text{ waves}$$

Pressure coefficient  $c_p = \frac{p - p_\infty}{\frac{1}{2} \rho_\infty u_\infty^2} = \pm \frac{2\theta}{\sqrt{M_\infty^2 - 1}}$  on upper/lower surface

**Prandtl-Glauert rule for linearised potential flow past geometrically similar bodies**



Pressure coefficient  $c_p = \frac{p - p_\infty}{\frac{1}{2} \rho_\infty u_\infty^2}$

For geometrically similar bodies with  $\frac{\eta}{L} = f\left(\frac{x}{L}\right)$  and  $c_p(M_\infty = 0) = c_{p0}$ ,

$$c_p = \frac{c_{p0}}{\sqrt{1 - M_\infty^2}} \quad \text{in subsonic flow}$$

$$c_p \propto \frac{1}{\sqrt{M_\infty^2 - 1}} \quad \text{in supersonic flow}$$

### Oblique Shock Relations (see tables)

$$\frac{p_2}{p_1} = 1 + \frac{2\gamma}{\gamma+1} (M_1^2 \sin^2 \beta - 1)$$

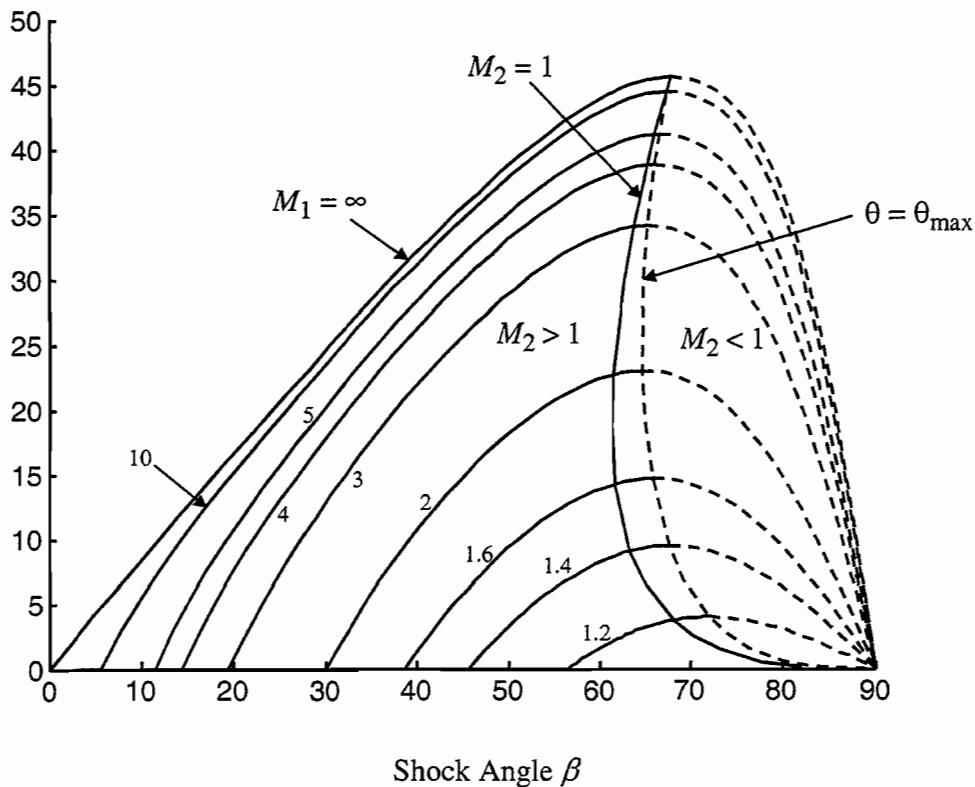
$$\frac{T_2}{T_1} = \frac{\gamma-1}{(\gamma+1)^2} \frac{2}{M_1^2 \sin^2 \beta} \left( 1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta \right) \left( \frac{2\gamma}{\gamma-1} M_1^2 \sin^2 \beta - 1 \right)$$

$$\frac{\rho_2}{\rho_1} = \frac{(\gamma+1)M_1^2 \sin^2 \beta}{2 \left[ 1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta \right]}$$

$$M_2 \sin(\beta - \theta) = \left[ \frac{1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta}{\gamma M_1^2 \sin^2 \beta - \frac{\gamma-1}{2}} \right]^{\frac{1}{2}}$$

$$\frac{p_{02}}{p_{01}} = \left( \frac{\frac{\gamma+1}{2} M_1^2 \sin^2 \beta}{1 + \frac{\gamma-1}{2} M_1^2 \sin^2 \beta} \right)^{\frac{\gamma}{\gamma-1}} \left( \frac{2\gamma}{\gamma+1} M_1^2 \sin^2 \beta - \frac{\gamma-1}{\gamma+1} \right)^{\frac{1}{1-\gamma}}$$

$$\tan \theta = \frac{2 \cot \beta (M_1^2 \sin^2 \beta - 1)}{(\gamma+1)M_1^2 - 2(M_1^2 \sin^2 \beta - 1)}$$



# GAS FLOW TABLES ( $\gamma=1.400$ ): SUBSONIC FLOW

$M$	$\frac{T}{T_0}$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{A p}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$
0.010	1.0000	0.9999	1.0000	0.0063	0.0221	0.0221	45.1813	7134.405	0.0001
0.020	0.9999	0.9997	0.9998	0.0126	0.0443	0.0443	22.5994	1778.450	0.0003
0.030	0.9998	0.9994	0.9996	0.0190	0.0664	0.0664	15.0761	787.0814	0.0006
0.040	0.9997	0.9989	0.9992	0.0253	0.0885	0.0886	11.3173	440.3522	0.0011
0.050	0.9995	0.9983	0.9988	0.0316	0.1105	0.1107	9.0644	280.0203	0.0017
0.060	0.9993	0.9975	0.9982	0.0379	0.1325	0.1329	7.5645	193.0311	0.0025
0.070	0.9990	0.9966	0.9976	0.0443	0.1545	0.1550	6.4947	140.6550	0.0034
0.080	0.9987	0.9955	0.9968	0.0506	0.1764	0.1772	5.6939	106.7182	0.0045
0.090	0.9984	0.9944	0.9960	0.0569	0.1983	0.1994	5.0723	83.4961	0.0056
0.100	0.9980	0.9930	0.9950	0.0632	0.2200	0.2216	4.5762	66.9216	0.0070
0.110	0.9976	0.9916	0.9940	0.0695	0.2417	0.2438	4.1714	54.6879	0.0084
0.120	0.9971	0.9900	0.9928	0.0758	0.2633	0.2660	3.8350	45.4080	0.0100
0.130	0.9966	0.9883	0.9916	0.0821	0.2849	0.2883	3.5513	38.2070	0.0117
0.140	0.9961	0.9864	0.9903	0.0884	0.3063	0.3105	3.3089	32.5113	0.0135
0.150	0.9955	0.9844	0.9888	0.0947	0.3276	0.3328	3.0996	27.9320	0.0155
0.160	0.9949	0.9823	0.9873	0.1009	0.3488	0.3551	2.9172	24.1978	0.0176
0.170	0.9943	0.9800	0.9857	0.1072	0.3699	0.3774	2.7569	21.1152	0.0198
0.180	0.9936	0.9776	0.9840	0.1135	0.3908	0.3997	2.6151	18.5427	0.0222
0.190	0.9928	0.9751	0.9822	0.1197	0.4116	0.4221	2.4889	16.3752	0.0246
0.200	0.9921	0.9725	0.9803	0.1260	0.4323	0.4445	2.3758	14.5333	0.0272
0.210	0.9913	0.9697	0.9783	0.1322	0.4528	0.4669	2.2740	12.9560	0.0299
0.220	0.9904	0.9668	0.9762	0.1385	0.4731	0.4893	2.1820	11.5961	0.0328
0.230	0.9895	0.9638	0.9740	0.1447	0.4933	0.5118	2.0985	10.4161	0.0357
0.240	0.9886	0.9607	0.9718	0.1509	0.5133	0.5343	2.0225	9.3865	0.0387
0.250	0.9877	0.9575	0.9694	0.1571	0.5332	0.5568	1.9530	8.4834	0.0419
0.260	0.9867	0.9541	0.9670	0.1633	0.5528	0.5794	1.8892	7.6876	0.0451
0.270	0.9856	0.9506	0.9645	0.1695	0.5723	0.6020	1.8306	6.9832	0.0485
0.280	0.9846	0.9470	0.9619	0.1757	0.5915	0.6246	1.7766	6.3572	0.0520
0.290	0.9835	0.9433	0.9592	0.1819	0.6106	0.6473	1.7267	5.7989	0.0555
0.300	0.9823	0.9395	0.9564	0.1881	0.6295	0.6700	1.6805	5.2993	0.0592
0.310	0.9811	0.9355	0.9535	0.1942	0.6481	0.6928	1.6377	4.8507	0.0629
0.320	0.9799	0.9315	0.9506	0.2003	0.6666	0.7156	1.5978	4.4467	0.0668
0.330	0.9787	0.9274	0.9476	0.2065	0.6848	0.7384	1.5608	4.0821	0.0707
0.340	0.9774	0.9231	0.9445	0.2126	0.7027	0.7613	1.5262	3.7520	0.0747
0.350	0.9761	0.9188	0.9413	0.2187	0.7205	0.7842	1.4939	3.4525	0.0788
0.360	0.9747	0.9143	0.9380	0.2248	0.7380	0.8072	1.4637	3.1801	0.0829
0.370	0.9733	0.9098	0.9347	0.2309	0.7553	0.8302	1.4354	2.9320	0.0872
0.380	0.9719	0.9052	0.9313	0.2369	0.7723	0.8532	1.4090	2.7054	0.0915
0.390	0.9705	0.9004	0.9278	0.2430	0.7891	0.8763	1.3841	2.4983	0.0959
0.400	0.9690	0.8956	0.9243	0.2490	0.8056	0.8995	1.3608	2.3085	0.1003
0.410	0.9675	0.8907	0.9207	0.2551	0.8219	0.9227	1.3388	2.1344	0.1048
0.420	0.9659	0.8857	0.9170	0.2611	0.8379	0.9460	1.3182	1.9744	0.1094
0.430	0.9643	0.8807	0.9132	0.2671	0.8536	0.9693	1.2988	1.8272	0.1140
0.440	0.9627	0.8755	0.9094	0.2730	0.8691	0.9927	1.2804	1.6915	0.1186
0.450	0.9611	0.8703	0.9055	0.2790	0.8843	1.0161	1.2632	1.5664	0.1234
0.460	0.9594	0.8650	0.9016	0.2850	0.8992	1.0396	1.2469	1.4509	0.1281
0.470	0.9577	0.8596	0.8976	0.2909	0.9138	1.0631	1.2315	1.3441	0.1329
0.480	0.9559	0.8541	0.8935	0.2968	0.9282	1.0867	1.2170	1.2453	0.1378
0.490	0.9542	0.8486	0.8894	0.3027	0.9423	1.1104	1.2033	1.1539	0.1426
0.500	0.9524	0.8430	0.8852	0.3086	0.9561	1.1341	1.1903	1.0691	0.1475

$$\gamma=1.400$$

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{A p}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\rho V^2$ $p_0$
0.510	0.9506	0.8374	0.8809	0.3145	0.9696	1.1579	1.1781	0.9904	0.1525
0.520	0.9487	0.8317	0.8766	0.3203	0.9828	1.1818	1.1665	0.9174	0.1574
0.530	0.9468	0.8259	0.8723	0.3262	0.9958	1.2057	1.1556	0.8496	0.1624
0.540	0.9449	0.8201	0.8679	0.3320	1.0084	1.2297	1.1452	0.7866	0.1674
0.550	0.9430	0.8142	0.8634	0.3378	1.0208	1.2538	1.1354	0.7281	0.1724
0.560	0.9410	0.8082	0.8589	0.3436	1.0328	1.2779	1.1261	0.6736	0.1774
0.570	0.9390	0.8022	0.8544	0.3493	1.0446	1.3021	1.1173	0.6229	0.1825
0.580	0.9370	0.7962	0.8498	0.3551	1.0561	1.3264	1.1090	0.5757	0.1875
0.590	0.9349	0.7901	0.8451	0.3608	1.0672	1.3507	1.1011	0.5317	0.1925
0.600	0.9328	0.7840	0.8405	0.3665	1.0781	1.3751	1.0937	0.4908	0.1976
0.610	0.9307	0.7778	0.8357	0.3722	1.0887	1.3996	1.0867	0.4527	0.2026
0.620	0.9286	0.7716	0.8310	0.3779	1.0990	1.4242	1.0800	0.4172	0.2076
0.630	0.9265	0.7654	0.8262	0.3835	1.1090	1.4489	1.0737	0.3841	0.2127
0.640	0.9243	0.7591	0.8213	0.3891	1.1186	1.4736	1.0678	0.3533	0.2177
0.650	0.9221	0.7528	0.8164	0.3948	1.1280	1.4984	1.0621	0.3246	0.2226
0.660	0.9199	0.7465	0.8115	0.4003	1.1371	1.5233	1.0568	0.2979	0.2276
0.670	0.9176	0.7401	0.8066	0.4059	1.1459	1.5483	1.0518	0.2730	0.2326
0.680	0.9153	0.7338	0.8016	0.4115	1.1544	1.5733	1.0471	0.2498	0.2375
0.690	0.9131	0.7274	0.7966	0.4170	1.1626	1.5984	1.0426	0.2282	0.2424
0.700	0.9107	0.7209	0.7916	0.4225	1.1705	1.6237	1.0384	0.2081	0.2473
0.710	0.9084	0.7145	0.7865	0.4280	1.1782	1.6490	1.0344	0.1895	0.2521
0.720	0.9061	0.7080	0.7814	0.4335	1.1855	1.6744	1.0307	0.1721	0.2569
0.730	0.9037	0.7016	0.7763	0.4389	1.1925	1.6999	1.0272	0.1561	0.2617
0.740	0.9013	0.6951	0.7712	0.4443	1.1993	1.7254	1.0239	0.1411	0.2664
0.750	0.8989	0.6886	0.7660	0.4497	1.2058	1.7511	1.0208	0.1273	0.2711
0.760	0.8964	0.6821	0.7609	0.4551	1.2119	1.7768	1.0179	0.1145	0.2758
0.770	0.8940	0.6756	0.7557	0.4605	1.2178	1.8027	1.0152	0.1026	0.2804
0.780	0.8915	0.6691	0.7505	0.4658	1.2234	1.8286	1.0126	0.0917	0.2849
0.790	0.8890	0.6625	0.7452	0.4711	1.2288	1.8547	1.0103	0.0816	0.2894
0.800	0.8865	0.6560	0.7400	0.4764	1.2338	1.8808	1.0081	0.0723	0.2939
0.810	0.8840	0.6495	0.7347	0.4817	1.2386	1.9070	1.0060	0.0638	0.2983
0.820	0.8815	0.6430	0.7295	0.4869	1.2431	1.9333	1.0041	0.0559	0.3026
0.830	0.8789	0.6365	0.7242	0.4921	1.2474	1.9598	1.0024	0.0488	0.3069
0.840	0.8763	0.6300	0.7189	0.4973	1.2514	1.9863	1.0008	0.0423	0.3112
0.850	0.8737	0.6235	0.7136	0.5025	1.2551	2.0129	0.9993	0.0363	0.3153
0.860	0.8711	0.6170	0.7083	0.5077	1.2585	2.0396	0.9979	0.0310	0.3195
0.870	0.8685	0.6106	0.7030	0.5128	1.2617	2.0665	0.9967	0.0261	0.3235
0.880	0.8659	0.6041	0.6977	0.5179	1.2646	2.0934	0.9956	0.0218	0.3275
0.890	0.8632	0.5977	0.6924	0.5230	1.2673	2.1204	0.9946	0.0179	0.3314
0.900	0.8606	0.5913	0.6870	0.5280	1.2698	2.1476	0.9937	0.0145	0.3352
0.910	0.8579	0.5849	0.6817	0.5331	1.2719	2.1748	0.9929	0.0115	0.3390
0.920	0.8552	0.5785	0.6764	0.5381	1.2739	2.2021	0.9922	0.0089	0.3427
0.930	0.8525	0.5721	0.6711	0.5431	1.2756	2.2296	0.9916	0.0067	0.3464
0.940	0.8498	0.5658	0.6658	0.5481	1.2770	2.2572	0.9911	0.0048	0.3499
0.950	0.8471	0.5595	0.6604	0.5530	1.2783	2.2848	0.9907	0.0033	0.3534
0.960	0.8444	0.5532	0.6551	0.5579	1.2793	2.3126	0.9903	0.0021	0.3569
0.970	0.8416	0.5469	0.6498	0.5628	1.2800	2.3405	0.9901	0.0011	0.3602
0.980	0.8389	0.5407	0.6445	0.5677	1.2806	2.3685	0.9899	0.0005	0.3635
0.990	0.8361	0.5345	0.6392	0.5725	1.2809	2.3966	0.9898	0.0001	0.3667
1.000	0.8333	0.5283	0.6339	0.5774	1.2810	2.4249	0.9897	0.0000	0.3698

# GAS FLOW TABLES ( $\gamma=1.400$ ): SUPERSONIC FLOW

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p}$	$F$	$\frac{4c_f L_{max}}{D}$	$\frac{1}{2} \rho V^2$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$\nu$	$M$
1.010	0.8306	0.5221	0.6287	0.5821	1.2809	2.4532	0.9898	0.0001	0.3728	0.9901	1.0000	1.0235	1.9152	1.0066	0.04	1.010
1.020	0.8278	0.5160	0.6234	0.5869	1.2806	2.4817	0.9899	0.0005	0.3758	0.9805	1.0000	1.0471	1.9379	1.0132	0.13	1.020
1.030	0.8250	0.5099	0.6181	0.5917	1.2801	2.5103	0.9900	0.0010	0.3787	0.9712	1.0000	1.0711	1.9610	1.0198	0.23	1.030
1.040	0.8222	0.5039	0.6129	0.5964	1.2793	2.5390	0.9903	0.0018	0.3815	0.9620	0.9999	1.0952	1.9844	1.0263	0.35	1.040
1.050	0.8193	0.4979	0.6077	0.6011	1.2784	2.5678	0.9905	0.0027	0.3842	0.9531	0.9999	1.1196	2.0083	1.0328	0.49	1.050
1.060	0.8165	0.4919	0.6024	0.6058	1.2773	2.5967	0.9909	0.0038	0.3869	0.9444	0.9998	1.1442	2.0325	1.0393	0.64	1.060
1.070	0.8137	0.4860	0.5972	0.6104	1.2760	2.6258	0.9913	0.0051	0.3895	0.9360	0.9996	1.1691	2.0570	1.0458	0.80	1.070
1.080	0.8108	0.4800	0.5920	0.6151	1.2745	2.6549	0.9917	0.0066	0.3919	0.9277	0.9994	1.1941	2.0819	1.0522	0.97	1.080
1.090	0.8080	0.4742	0.5869	0.6197	1.2728	2.6842	0.9922	0.0082	0.3944	0.9196	0.9992	1.2195	2.1072	1.0586	1.15	1.090
1.100	0.8052	0.4684	0.5817	0.6243	1.2709	2.7136	0.9928	0.0099	0.3967	0.9118	0.9999	1.2450	2.1328	1.0649	1.34	1.100
1.110	0.8023	0.4626	0.5766	0.6288	1.2689	2.7432	0.9934	0.0118	0.3990	0.9041	0.9986	1.2708	2.1588	1.0713	1.53	1.110
1.120	0.7994	0.4568	0.5714	0.6333	1.2667	2.7728	0.9940	0.0138	0.4011	0.8966	0.9982	1.2968	2.1851	1.0776	1.74	1.120
1.130	0.7966	0.4511	0.5663	0.6379	1.2643	2.8026	0.9947	0.0159	0.4032	0.8892	0.9978	1.3231	2.2118	1.0840	1.94	1.130
1.140	0.7937	0.4455	0.5612	0.6423	1.2618	2.8325	0.9954	0.0182	0.4052	0.8820	0.9973	1.3495	2.2388	1.0903	2.16	1.140
1.150	0.7908	0.4398	0.5562	0.6468	1.2590	2.8626	0.9961	0.0205	0.4072	0.8750	0.9967	1.3763	2.2661	1.0966	2.38	1.150
1.160	0.7879	0.4343	0.5511	0.6512	1.2562	2.8927	0.9969	0.0230	0.4090	0.8682	0.9961	1.4032	2.2937	1.1029	2.61	1.160
1.170	0.7851	0.4287	0.5461	0.6556	1.2531	2.9230	0.9978	0.0255	0.4108	0.8615	0.9953	1.4304	2.3217	1.1092	2.84	1.170
1.180	0.7822	0.4232	0.5411	0.6600	1.2500	2.9534	0.9986	0.0281	0.4125	0.8549	0.9946	1.4578	2.3500	1.1154	3.07	1.180
1.190	0.7793	0.4178	0.5361	0.6644	1.2466	2.9840	0.9995	0.0309	0.4141	0.8485	0.9937	1.4855	2.3786	1.1217	3.31	1.190
1.200	0.7764	0.4124	0.5311	0.6687	1.2432	3.0147	1.0004	0.0336	0.4157	0.8422	0.9928	1.5133	2.4075	1.1280	3.56	1.200
1.210	0.7735	0.4070	0.5262	0.6730	1.2396	3.0455	1.0014	0.0365	0.4171	0.8360	0.9918	1.5415	2.4367	1.1343	3.81	1.210
1.220	0.7706	0.4017	0.5213	0.6773	1.2358	3.0764	1.0024	0.0394	0.4185	0.8300	0.9907	1.5698	2.4663	1.1405	4.06	1.220
1.230	0.7677	0.3964	0.5164	0.6816	1.2319	3.1075	1.0034	0.0424	0.4198	0.8241	0.9896	1.5984	2.4961	1.1468	4.31	1.230
1.240	0.7648	0.3912	0.5115	0.6858	1.2279	3.1387	1.0045	0.0455	0.4211	0.8183	0.9884	1.6272	2.5263	1.1531	4.57	1.240
1.250	0.7619	0.3861	0.5067	0.6901	1.2238	3.1700	1.0055	0.0486	0.4223	0.8126	0.9871	1.6563	2.5568	1.1594	4.83	1.250

$\gamma=1.400$

$M$	$\frac{T}{T_0}$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{m\sqrt{c_p T_0}}{A p_0}$	$\frac{m\sqrt{c_p T_0}}{A p}$	$F$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$\nu$	$M$
1.260	0.7590	0.3809	0.5019	0.6943	1.2195	3.2015	1.0066	0.0517	0.4293	0.8071	0.9857	1.6855	2.5875	1.1657	5.09	1.260
1.270	0.7561	0.3759	0.4971	0.6984	1.2152	3.2331	1.0077	0.0549	0.4244	0.8016	0.9842	1.7151	2.6186	1.1720	5.36	1.270
1.280	0.7532	0.3708	0.4923	0.7026	1.2107	3.2648	1.0089	0.0582	0.4253	0.7963	0.9827	1.7448	2.6500	1.1783	5.63	1.280
1.290	0.7503	0.3658	0.4876	0.7067	1.2061	3.2967	1.0100	0.0615	0.4262	0.7911	0.9811	1.7748	2.6816	1.1846	5.90	1.290
1.300	0.7474	0.3609	0.4829	0.7108	1.2014	3.3287	1.0112	0.0648	0.4270	0.7860	0.9794	1.8050	2.7136	1.1909	6.17	1.300
1.310	0.7445	0.3560	0.4782	0.7149	1.1965	3.3608	1.0124	0.0682	0.4277	0.7809	0.9776	1.8355	2.7459	1.1972	6.44	1.310
1.320	0.7416	0.3512	0.4736	0.7189	1.1916	3.3931	1.0136	0.0716	0.4283	0.7760	0.9758	1.8661	2.7784	1.2035	6.72	1.320
1.330	0.7387	0.3464	0.4690	0.7229	1.1866	3.4255	1.0149	0.0750	0.4289	0.7712	0.9738	1.8971	2.8112	1.2099	7.00	1.330
1.340	0.7358	0.3417	0.4644	0.7270	1.1815	3.4581	1.0161	0.0785	0.4294	0.7664	0.9718	1.9282	2.8444	1.2162	7.28	1.340
1.350	0.7329	0.3370	0.4598	0.7309	1.1763	3.4907	1.0174	0.0820	0.4299	0.7618	0.9697	1.9596	2.8778	1.2226	7.56	1.350
1.360	0.7300	0.3323	0.4553	0.7349	1.1710	3.5236	1.0187	0.0855	0.4303	0.7572	0.9676	1.9912	2.9115	1.2290	7.84	1.360
1.370	0.7271	0.3277	0.4508	0.7388	1.1656	3.5566	1.0200	0.0890	0.4306	0.7527	0.9653	2.0231	2.9455	1.2354	8.13	1.370
1.380	0.7242	0.3232	0.4463	0.7427	1.1601	3.5897	1.0213	0.0926	0.4308	0.7483	0.9630	2.0551	2.9798	1.2418	8.41	1.380
1.390	0.7213	0.3187	0.4418	0.7466	1.1546	3.6229	1.0226	0.0962	0.4310	0.7440	0.9607	2.0875	3.0144	1.2482	8.70	1.390
1.400	0.7184	0.3142	0.4374	0.7505	1.1490	3.6563	1.0240	0.0997	0.4311	0.7397	0.9582	2.1200	3.0492	1.2547	8.99	1.400
1.410	0.7155	0.3098	0.4330	0.7543	1.1433	3.6899	1.0253	0.1033	0.4312	0.7355	0.9557	2.1528	3.0844	1.2612	9.28	1.410
1.420	0.7126	0.3055	0.4287	0.7581	1.1375	3.7236	1.0267	0.1069	0.4312	0.7314	0.9531	2.1858	3.1198	1.2676	9.57	1.420
1.430	0.7097	0.3012	0.4244	0.7619	1.1317	3.7574	1.0281	0.1106	0.4311	0.7274	0.9504	2.2191	3.1555	1.2741	9.86	1.430
1.440	0.7069	0.2969	0.4201	0.7657	1.1258	3.7914	1.0295	0.1142	0.4310	0.7235	0.9476	2.2525	3.1915	1.2807	10.15	1.440
1.450	0.7040	0.2927	0.4158	0.7694	1.1198	3.8255	1.0308	0.1178	0.4308	0.7196	0.9448	2.2863	3.2278	1.2872	10.44	1.450
1.460	0.7011	0.2886	0.4116	0.7732	1.1138	3.8598	1.0323	0.1215	0.4306	0.7157	0.9420	2.3202	3.2643	1.2938	10.73	1.460
1.470	0.6982	0.2845	0.4074	0.7769	1.1077	3.8942	1.0337	0.1251	0.4303	0.7120	0.9390	2.3544	3.3011	1.3003	11.02	1.470
1.480	0.6954	0.2804	0.4032	0.7805	1.1016	3.9287	1.0351	0.1288	0.4299	0.7083	0.9360	2.3888	3.3382	1.3069	11.32	1.480
1.490	0.6925	0.2764	0.3991	0.7842	1.0954	3.9634	1.0365	0.1324	0.4295	0.7047	0.9329	2.4235	3.3756	1.3136	11.61	1.490
1.500	0.6897	0.2724	0.3950	0.7878	1.0891	3.9983	1.0379	0.1361	0.4290	0.7011	0.9298	2.4583	3.4133	1.3202	11.91	1.500

$\gamma=1.400$

$M$	$\frac{T}{T_0}$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p}$	$\frac{F}{\dot{m} \sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2} \rho V^2$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$\nu$	$M$
1.510	0.6868	0.2685	0.3909	0.7914	1.0829	4.0333	1.0394	0.1397	0.4285	0.6976	0.9286	2.4935	3.4512	1.3269	12.20	1.510
1.520	0.6840	0.2646	0.3869	0.7950	1.0765	4.0684	1.0408	0.1433	0.4279	0.6941	0.9233	2.5288	3.4894	1.3336	12.49	1.520
1.530	0.6811	0.2608	0.3829	0.7986	1.0702	4.1037	1.0423	0.1470	0.4273	0.6907	0.9200	2.5644	3.5279	1.3403	12.79	1.530
1.540	0.6783	0.2570	0.3789	0.8021	1.0638	4.1392	1.0437	0.1506	0.4266	0.6874	0.9166	2.6002	3.5667	1.3470	13.09	1.540
1.550	0.6754	0.2533	0.3750	0.8057	1.0573	4.1748	1.0452	0.1543	0.4259	0.6841	0.9132	2.6363	3.6057	1.3538	13.38	1.550
1.560	0.6726	0.2496	0.3710	0.8092	1.0508	4.2105	1.0467	0.1579	0.4252	0.6809	0.9097	2.6725	3.6450	1.3606	13.68	1.560
1.570	0.6698	0.2459	0.3672	0.8126	1.0443	4.2464	1.0481	0.1615	0.4243	0.6777	0.9062	2.7091	3.6846	1.3674	13.97	1.570
1.580	0.6670	0.2423	0.3633	0.8161	1.0378	4.2825	1.0496	0.1651	0.4235	0.6746	0.9026	2.7458	3.7244	1.3742	14.27	1.580
1.590	0.6642	0.2388	0.3595	0.8195	1.0312	4.3187	1.0511	0.1688	0.4226	0.6715	0.8989	2.7828	3.7646	1.3811	14.56	1.590
1.600	0.6614	0.2353	0.3557	0.8230	1.0246	4.3551	1.0526	0.1724	0.4216	0.6684	0.8952	2.8200	3.8050	1.3880	14.86	1.600
1.610	0.6586	0.2318	0.3520	0.8263	1.0180	4.3916	1.0541	0.1760	0.4206	0.6655	0.8915	2.8575	3.8456	1.3949	15.16	1.610
1.620	0.6558	0.2284	0.3483	0.8297	1.0114	4.4282	1.0555	0.1795	0.4196	0.6625	0.8877	2.8951	3.8866	1.4018	15.45	1.620
1.630	0.6530	0.2250	0.3446	0.8331	1.0047	4.4651	1.0570	0.1831	0.4185	0.6596	0.8838	2.9331	3.9278	1.4088	15.75	1.630
1.640	0.6502	0.2217	0.3409	0.8364	0.9980	4.5020	1.0585	0.1867	0.4174	0.6568	0.8799	2.9712	3.9693	1.4158	16.04	1.640
1.650	0.6475	0.2184	0.3373	0.8397	0.9913	4.5392	1.0600	0.1902	0.4162	0.6540	0.8760	3.0096	4.0110	1.4228	16.34	1.650
1.660	0.6447	0.2151	0.3337	0.8430	0.9846	4.5765	1.0615	0.1938	0.4150	0.6512	0.8720	3.0482	4.0531	1.4299	16.63	1.660
1.670	0.6419	0.2119	0.3302	0.8462	0.9779	4.6139	1.0630	0.1973	0.4138	0.6485	0.8680	3.0871	4.0953	1.4369	16.93	1.670
1.680	0.6392	0.2088	0.3266	0.8495	0.9712	4.6515	1.0645	0.2008	0.4125	0.6458	0.8639	3.1261	4.1379	1.4440	17.22	1.680
1.690	0.6364	0.2057	0.3232	0.8527	0.9644	4.6892	1.0660	0.2043	0.4112	0.6431	0.8599	3.1655	4.1807	1.4512	17.52	1.690
1.700	0.6337	0.2026	0.3197	0.8559	0.9577	4.7272	1.0674	0.2078	0.4098	0.6405	0.8557	3.2050	4.2238	1.4583	17.81	1.700
1.710	0.6310	0.1996	0.3163	0.8591	0.9509	4.7652	1.0689	0.2113	0.4085	0.6380	0.8516	3.2448	4.2672	1.4655	18.10	1.710
1.720	0.6283	0.1966	0.3129	0.8622	0.9442	4.8035	1.0704	0.2147	0.4071	0.6355	0.8474	3.2848	4.3108	1.4727	18.40	1.720
1.730	0.6256	0.1936	0.3095	0.8654	0.9374	4.8418	1.0719	0.2182	0.4056	0.6330	0.8431	3.3251	4.3547	1.4800	18.69	1.730
1.740	0.6229	0.1907	0.3062	0.8685	0.9307	4.8804	1.0734	0.2216	0.4041	0.6305	0.8389	3.3655	4.3989	1.4873	18.98	1.740
1.750	0.6202	0.1878	0.3029	0.8716	0.9239	4.9191	1.0749	0.2250	0.4026	0.6281	0.8346	3.4063	4.4433	1.4946	19.27	1.750

$\gamma=1.400$

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{m\sqrt{c_p T_0}}{Ap_0}$	$\frac{m\sqrt{c_p T_0}}{Ap}$	$F$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$v$	$M$
1.760	0.6175	0.1850	0.2996	0.8747	0.9172	4.9580	1.0764	0.2284	0.4011	0.6257	0.8302	3.4472	4.4880	1.5019	19.56	1.760
1.770	0.6148	0.1822	0.2964	0.8777	0.9104	4.9970	1.0779	0.2318	0.3996	0.6234	0.8259	3.4884	4.5330	1.5093	19.86	1.770
1.780	0.6121	0.1794	0.2931	0.8808	0.9037	5.0362	1.0793	0.2352	0.3980	0.6210	0.8215	3.5298	4.5782	1.5167	20.15	1.780
1.790	0.6095	0.1767	0.2900	0.8838	0.8970	5.0755	1.0808	0.2385	0.3964	0.6188	0.8171	3.5715	4.6237	1.5241	20.44	1.790
1.800	0.6068	0.1740	0.2868	0.8868	0.8902	5.1150	1.0823	0.2419	0.3947	0.6165	0.8127	3.6133	4.6695	1.5316	20.73	1.800
1.810	0.6041	0.1714	0.2837	0.8898	0.8835	5.1547	1.0838	0.2452	0.3931	0.6143	0.8082	3.6555	4.7155	1.5391	21.01	1.810
1.820	0.6015	0.1688	0.2806	0.8927	0.8768	5.1945	1.0852	0.2485	0.3914	0.6121	0.8038	3.6978	4.7618	1.5466	21.30	1.820
1.830	0.5989	0.1662	0.2776	0.8957	0.8701	5.2345	1.0867	0.2518	0.3897	0.6099	0.7993	3.7404	4.8084	1.5541	21.59	1.830
1.840	0.5963	0.1637	0.2745	0.8986	0.8634	5.2747	1.0882	0.2551	0.3879	0.6078	0.7948	3.7832	4.8552	1.5617	21.88	1.840
1.850	0.5936	0.1612	0.2715	0.9015	0.8568	5.3150	1.0896	0.2583	0.3862	0.6057	0.7902	3.8263	4.9023	1.5693	22.16	1.850
1.860	0.5910	0.1587	0.2686	0.9044	0.8501	5.3555	1.0911	0.2616	0.3844	0.6036	0.7857	3.8695	4.9497	1.5770	22.45	1.860
1.870	0.5884	0.1563	0.2656	0.9072	0.8435	5.3962	1.0926	0.2648	0.3826	0.6016	0.7811	3.9131	4.9973	1.5847	22.73	1.870
1.880	0.5859	0.1539	0.2627	0.9101	0.8368	5.4370	1.0940	0.2680	0.3808	0.5996	0.7765	3.9568	5.0452	1.5924	23.02	1.880
1.890	0.5833	0.1516	0.2598	0.9129	0.8302	5.4780	1.0955	0.2712	0.3790	0.5976	0.7720	4.0008	5.0934	1.6001	23.30	1.890
1.900	0.5807	0.1492	0.2570	0.9157	0.8237	5.5191	1.0969	0.2743	0.3771	0.5956	0.7674	4.0450	5.1418	1.6079	23.59	1.900
1.910	0.5782	0.1470	0.2542	0.9185	0.8171	5.5604	1.0984	0.2775	0.3753	0.5937	0.7627	4.0895	5.1905	1.6157	23.87	1.910
1.920	0.5756	0.1447	0.2514	0.9213	0.8106	5.6019	1.0998	0.2806	0.3734	0.5918	0.7581	4.1341	5.2394	1.6236	24.15	1.920
1.930	0.5731	0.1425	0.2486	0.9240	0.8041	5.6435	1.1012	0.2837	0.3715	0.5899	0.7535	4.1791	5.2886	1.6314	24.43	1.930
1.940	0.5705	0.1403	0.2459	0.9268	0.7976	5.6853	1.1027	0.2868	0.3696	0.5880	0.7488	4.2242	5.3381	1.6394	24.71	1.940
1.950	0.5680	0.1381	0.2432	0.9295	0.7911	5.7273	1.1041	0.2899	0.3677	0.5862	0.7442	4.2696	5.3878	1.6473	24.99	1.950
1.960	0.5655	0.1360	0.2405	0.9322	0.7846	5.7695	1.1055	0.2929	0.3657	0.5844	0.7395	4.3152	5.4378	1.6553	25.27	1.960
1.970	0.5630	0.1339	0.2378	0.9349	0.7782	5.8118	1.1069	0.2960	0.3638	0.5826	0.7349	4.3611	5.4881	1.6633	25.55	1.970
1.980	0.5605	0.1318	0.2352	0.9375	0.7718	5.8542	1.1084	0.2990	0.3618	0.5808	0.7302	4.4071	5.5386	1.6713	25.83	1.980
1.990	0.5580	0.1298	0.2326	0.9402	0.7655	5.8969	1.1098	0.3020	0.3598	0.5791	0.7255	4.4535	5.5894	1.6794	26.10	1.990
2.000	0.5556	0.1278	0.2300	0.9428	0.7591	5.9397	1.1112	0.3050	0.3579	0.5774	0.7209	4.5000	5.6404	1.6875	26.38	2.000



$\gamma=1.400$

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p}$	$F$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2} \rho V^2$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$v$	$M$
2.010	0.5531	0.1258	0.2275	0.9454	0.7528	5.9827	1.1126	0.3080	0.3559	0.5757	0.7162	4.5468	5.6918	1.6956	26.66	2.010
2.020	0.5506	0.1239	0.2250	0.9480	0.7465	6.0258	1.1140	0.3109	0.3539	0.5740	0.7115	4.5938	5.7433	1.7038	26.93	2.020
2.030	0.5482	0.1220	0.2225	0.9506	0.7403	6.0692	1.1154	0.3138	0.3518	0.5723	0.7069	4.6411	5.7952	1.7120	27.20	2.030
2.040	0.5458	0.1201	0.2200	0.9531	0.7340	6.1126	1.1167	0.3168	0.3498	0.5707	0.7022	4.6885	5.8473	1.7203	27.48	2.040
2.050	0.5433	0.1182	0.2176	0.9557	0.7279	6.1563	1.1181	0.3197	0.3478	0.5691	0.6975	4.7363	5.8996	1.7285	27.75	2.050
2.060	0.5409	0.1164	0.2152	0.9582	0.7217	6.2001	1.1195	0.3225	0.3458	0.5675	0.6928	4.7842	5.9523	1.7369	28.02	2.060
2.070	0.5385	0.1146	0.2128	0.9607	0.7156	6.2441	1.1209	0.3254	0.3437	0.5659	0.6882	4.8324	6.0051	1.7452	28.29	2.070
2.080	0.5361	0.1128	0.2104	0.9632	0.7095	6.2883	1.1222	0.3282	0.3417	0.5643	0.6835	4.8808	6.0583	1.7536	28.56	2.080
2.090	0.5337	0.1111	0.2081	0.9657	0.7034	6.3326	1.1236	0.3310	0.3396	0.5628	0.6789	4.9295	6.1117	1.7620	28.83	2.090
2.100	0.5313	0.1094	0.2058	0.9681	0.6974	6.3772	1.1250	0.3339	0.3376	0.5613	0.6742	4.9783	6.1654	1.7705	29.10	2.100
2.110	0.5290	0.1077	0.2035	0.9706	0.6914	6.4218	1.1263	0.3366	0.3355	0.5598	0.6696	5.0275	6.2193	1.7789	29.36	2.110
2.120	0.5266	0.1060	0.2013	0.9730	0.6854	6.4667	1.1276	0.3394	0.3334	0.5583	0.6649	5.0768	6.2735	1.7875	29.63	2.120
2.130	0.5243	0.1043	0.1990	0.9754	0.6795	6.5117	1.1290	0.3422	0.3314	0.5568	0.6603	5.1264	6.3280	1.7960	29.90	2.130
2.140	0.5219	0.1027	0.1968	0.9778	0.6736	6.5569	1.1303	0.3449	0.3293	0.5554	0.6557	5.1762	6.3827	1.8046	30.16	2.140
2.150	0.5196	0.1011	0.1946	0.9802	0.6677	6.6023	1.1317	0.3476	0.3272	0.5540	0.6511	5.2263	6.4377	1.8132	30.43	2.150
2.160	0.5173	0.0996	0.1925	0.9825	0.6619	6.6478	1.1330	0.3503	0.3252	0.5525	0.6464	5.2765	6.4929	1.8219	30.69	2.160
2.170	0.5150	0.0980	0.1903	0.9849	0.6561	6.6936	1.1343	0.3530	0.3231	0.5511	0.6419	5.3271	6.5484	1.8306	30.95	2.170
2.180	0.5127	0.0965	0.1882	0.9872	0.6503	6.7395	1.1356	0.3556	0.3210	0.5498	0.6373	5.3778	6.6042	1.8393	31.21	2.180
2.190	0.5104	0.0950	0.1861	0.9895	0.6446	6.7855	1.1369	0.3583	0.3189	0.5484	0.6327	5.4288	6.6602	1.8481	31.47	2.190
2.200	0.5081	0.0935	0.1841	0.9918	0.6389	6.8318	1.1382	0.3609	0.3169	0.5471	0.6281	5.4800	6.7165	1.8569	31.73	2.200
2.210	0.5059	0.0921	0.1820	0.9941	0.6333	6.8782	1.1395	0.3635	0.3148	0.5457	0.6236	5.5315	6.7730	1.8657	31.99	2.210
2.220	0.5036	0.0906	0.1800	0.9964	0.6277	6.9248	1.1408	0.3661	0.3127	0.5444	0.6191	5.5831	6.8298	1.8746	32.25	2.220
2.230	0.5014	0.0892	0.1780	0.9986	0.6221	6.9715	1.1421	0.3687	0.3106	0.5431	0.6145	5.6351	6.8869	1.8835	32.51	2.230
2.240	0.4991	0.0878	0.1760	1.0009	0.6165	7.0185	1.1434	0.3712	0.3085	0.5418	0.6100	5.6872	6.9442	1.8924	32.76	2.240
2.250	0.4969	0.0865	0.1740	1.0031	0.6110	7.0656	1.1446	0.3738	0.3065	0.5406	0.6055	5.7396	7.0018	1.9014	33.02	2.250

$$\gamma=1.400$$

$M$	$\frac{T}{T_0}$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p}$	$F$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2} \rho V^2$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$\nu$	$M$
2.260	0.4947	0.0851	0.1721	1.0053	0.6056	7.1129	1.1459	0.3763	0.3044	0.5393	0.6011	5.7922	7.0597	1.9104	33.27	2.260
2.270	0.4925	0.0838	0.1702	1.0075	0.6002	7.1603	1.1472	0.3788	0.3023	0.5381	0.5966	5.8451	7.1178	1.9194	33.53	2.270
2.280	0.4903	0.0825	0.1683	1.0097	0.5948	7.2080	1.1484	0.3813	0.3003	0.5368	0.5921	5.8981	7.1762	1.9285	33.78	2.280
2.290	0.4881	0.0812	0.1664	1.0118	0.5894	7.2558	1.1497	0.3838	0.2982	0.5356	0.5877	5.9515	7.2348	1.9376	34.03	2.290
2.300	0.4859	0.0800	0.1646	1.0140	0.5841	7.3038	1.1509	0.3862	0.2961	0.5344	0.5833	6.0050	7.2937	1.9468	34.28	2.300
2.310	0.4837	0.0787	0.1628	1.0161	0.5788	7.3520	1.1521	0.3887	0.2941	0.5332	0.5789	6.0588	7.3528	1.9560	34.53	2.310
2.320	0.4816	0.0775	0.1609	1.0182	0.5736	7.4003	1.1534	0.3911	0.2920	0.5321	0.5745	6.1128	7.4122	1.9652	34.78	2.320
2.330	0.4794	0.0763	0.1592	1.0204	0.5684	7.4488	1.1546	0.3935	0.2900	0.5309	0.5702	6.1671	7.4719	1.9745	35.03	2.330
2.340	0.4773	0.0751	0.1574	1.0224	0.5632	7.4975	1.1558	0.3959	0.2879	0.5297	0.5658	6.2215	7.5319	1.9838	35.28	2.340
2.350	0.4752	0.0740	0.1556	1.0245	0.5581	7.5464	1.1570	0.3983	0.2859	0.5286	0.5615	6.2763	7.5920	1.9931	35.53	2.350
2.360	0.4731	0.0728	0.1539	1.0266	0.5530	7.5955	1.1582	0.4006	0.2839	0.5275	0.5572	6.3312	7.6525	2.0025	35.77	2.360
2.370	0.4709	0.0717	0.1522	1.0286	0.5480	7.6447	1.1595	0.4030	0.2818	0.5264	0.5529	6.3864	7.7132	2.0119	36.02	2.370
2.380	0.4688	0.0706	0.1505	1.0307	0.5430	7.6941	1.1606	0.4053	0.2798	0.5253	0.5486	6.4418	7.7742	2.0213	36.26	2.380
2.390	0.4668	0.0695	0.1488	1.0327	0.5380	7.7437	1.1618	0.4076	0.2778	0.5242	0.5444	6.4975	7.8354	2.0308	36.50	2.390
2.400	0.4647	0.0684	0.1472	1.0347	0.5331	7.7935	1.1630	0.4099	0.2758	0.5231	0.5401	6.5533	7.8969	2.0403	36.75	2.400
2.410	0.4626	0.0673	0.1456	1.0367	0.5282	7.8434	1.1642	0.4122	0.2738	0.5221	0.5359	6.6095	7.9587	2.0499	36.99	2.410
2.420	0.4606	0.0663	0.1439	1.0387	0.5233	7.8935	1.1654	0.4144	0.2718	0.5210	0.5317	6.6658	8.0207	2.0595	37.23	2.420
2.430	0.4585	0.0653	0.1424	1.0407	0.5185	7.9438	1.1665	0.4167	0.2698	0.5200	0.5276	6.7224	8.0830	2.0691	37.47	2.430
2.440	0.4565	0.0643	0.1408	1.0426	0.5137	7.9943	1.1677	0.4189	0.2678	0.5189	0.5234	6.7792	8.1455	2.0788	37.71	2.440
2.450	0.4544	0.0633	0.1392	1.0446	0.5090	8.0450	1.1689	0.4211	0.2658	0.5179	0.5193	6.8363	8.2083	2.0885	37.95	2.450
2.460	0.4524	0.0623	0.1377	1.0465	0.5043	8.0958	1.1700	0.4233	0.2639	0.5169	0.5152	6.8935	8.2713	2.0982	38.18	2.460
2.470	0.4504	0.0613	0.1362	1.0484	0.4996	8.1468	1.1712	0.4255	0.2619	0.5159	0.5111	6.9511	8.3346	2.1080	38.42	2.470
2.480	0.4484	0.0604	0.1346	1.0503	0.4950	8.1980	1.1723	0.4277	0.2599	0.5149	0.5071	7.0088	8.3982	2.1178	38.66	2.480
2.490	0.4464	0.0594	0.1332	1.0522	0.4904	8.2494	1.1734	0.4298	0.2580	0.5140	0.5030	7.0668	8.4620	2.1276	38.89	2.490
2.500	0.4444	0.0585	0.1317	1.0541	0.4858	8.3010	1.1746	0.4320	0.2561	0.5130	0.4990	7.1250	8.5261	2.1375	39.12	2.500

$$\gamma=1.400$$

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{m\sqrt{c_p T_0}}{A p_0}$	$\frac{m\sqrt{c_p T_0}}{A p}$	$F$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\rho V^2$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$V$	$M$
2.510	0.4425	0.0576	0.1302	1.0560	0.4813	8.3527	1.1757	0.4341	0.2541	0.5120	0.4950	7.1835	8.5905	2.1474	39.36	2.510
2.520	0.4405	0.0567	0.1288	1.0578	0.4768	8.4046	1.1768	0.4362	0.2522	0.5111	0.4911	7.2421	8.6551	2.1574	39.59	2.520
2.530	0.4386	0.0559	0.1274	1.0597	0.4724	8.4567	1.1779	0.4383	0.2503	0.5102	0.4871	7.3011	8.7200	2.1674	39.82	2.530
2.540	0.4366	0.0550	0.1260	1.0615	0.4680	8.5090	1.1790	0.4404	0.2484	0.5092	0.4832	7.3602	8.7851	2.1774	40.05	2.540
2.550	0.4347	0.0542	0.1246	1.0633	0.4636	8.5615	1.1801	0.4425	0.2465	0.5083	0.4793	7.4196	8.8505	2.1875	40.28	2.550
2.560	0.4328	0.0533	0.1232	1.0651	0.4593	8.6141	1.1812	0.4445	0.2446	0.5074	0.4754	7.4792	8.9161	2.1976	40.51	2.560
2.570	0.4309	0.0525	0.1218	1.0669	0.4550	8.6670	1.1823	0.4466	0.2427	0.5065	0.4715	7.5391	8.9820	2.2077	40.74	2.570
2.580	0.4289	0.0517	0.1205	1.0687	0.4507	8.7200	1.1834	0.4486	0.2409	0.5056	0.4677	7.5991	9.0482	2.2179	40.96	2.580
2.590	0.4271	0.0509	0.1192	1.0705	0.4465	8.7732	1.1844	0.4506	0.2390	0.5047	0.4639	7.6595	9.1146	2.2281	41.19	2.590
2.600	0.4252	0.0501	0.1179	1.0722	0.4423	8.8265	1.1855	0.4526	0.2371	0.5039	0.4601	7.7200	9.1813	2.2383	41.41	2.600
2.610	0.4233	0.0493	0.1166	1.0740	0.4382	8.8801	1.1866	0.4546	0.2353	0.5030	0.4564	7.7808	9.2483	2.2486	41.64	2.610
2.620	0.4214	0.0486	0.1153	1.0757	0.4341	8.9338	1.1876	0.4565	0.2335	0.5022	0.4526	7.8418	9.3155	2.2590	41.86	2.620
2.630	0.4196	0.0478	0.1140	1.0774	0.4300	8.9877	1.1887	0.4585	0.2317	0.5013	0.4489	7.9031	9.3829	2.2693	42.09	2.630
2.640	0.4177	0.0471	0.1128	1.0791	0.4260	9.0418	1.1897	0.4604	0.2298	0.5005	0.4452	7.9645	9.4506	2.2797	42.31	2.640
2.650	0.4159	0.0464	0.1115	1.0808	0.4220	9.0961	1.1908	0.4624	0.2280	0.4996	0.4416	8.0263	9.5186	2.2902	42.53	2.650
2.660	0.4141	0.0457	0.1103	1.0825	0.4180	9.1506	1.1918	0.4643	0.2262	0.4988	0.4379	8.0882	9.5869	2.3006	42.75	2.660
2.670	0.4122	0.0450	0.1091	1.0842	0.4141	9.2052	1.1928	0.4662	0.2245	0.4980	0.4343	8.1504	9.6554	2.3111	42.97	2.670
2.680	0.4104	0.0443	0.1079	1.0859	0.4102	9.2601	1.1939	0.4681	0.2227	0.4972	0.4307	8.2128	9.7241	2.3217	43.19	2.680
2.690	0.4086	0.0436	0.1067	1.0875	0.4063	9.3151	1.1949	0.4700	0.2209	0.4964	0.4271	8.2755	9.7931	2.3323	43.40	2.690
2.700	0.4068	0.0430	0.1056	1.0892	0.4025	9.3703	1.1959	0.4718	0.2192	0.4956	0.4236	8.3383	9.8624	2.3429	43.62	2.700
2.710	0.4051	0.0423	0.1044	1.0908	0.3987	9.4257	1.1969	0.4737	0.2174	0.4949	0.4201	8.4015	9.9319	2.3536	43.84	2.710
2.720	0.4033	0.0417	0.1033	1.0924	0.3949	9.4812	1.1979	0.4755	0.2157	0.4941	0.4166	8.4648	10.0017	2.3642	44.05	2.720
2.730	0.4015	0.0410	0.1022	1.0941	0.3912	9.5370	1.1989	0.4773	0.2140	0.4933	0.4131	8.5284	10.0718	2.3750	44.27	2.730
2.740	0.3998	0.0404	0.1010	1.0957	0.3875	9.5929	1.1999	0.4791	0.2123	0.4926	0.4097	8.5922	10.1421	2.3858	44.48	2.740
2.750	0.3980	0.0398	0.0999	1.0973	0.3838	9.6490	1.2009	0.4809	0.2106	0.4918	0.4062	8.6563	10.2127	2.3966	44.69	2.750

$\gamma=1.400$

$M$	$\frac{T}{T_0}$	$\frac{P}{P_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m} \sqrt{c_p T_0}}{A p}$	$F$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2} \rho V^2$	$M_s$	$\frac{P_{0s}}{P_0}$	$\frac{P_s}{P}$	$\frac{P_{0s}}{P}$	$\frac{T_s}{T}$	$\nu$	$M$
2.760	0.3963	0.0392	0.0989	1.0988	0.3802	9.7053	1.2019	0.4827	0.2089	0.4911	0.4028	8.7205	10.2835	2.4074	44.91	2.760
2.770	0.3945	0.0386	0.0978	1.1004	0.3766	9.7618	1.2029	0.4845	0.2072	0.4903	0.3994	8.7851	10.3546	2.4183	45.12	2.770
2.780	0.3928	0.0380	0.0967	1.1020	0.3730	9.8185	1.2038	0.4863	0.2055	0.4896	0.3961	8.8498	10.4259	2.4292	45.33	2.780
2.790	0.3911	0.0374	0.0957	1.1035	0.3695	9.8753	1.2048	0.4880	0.2039	0.4889	0.3928	8.9148	10.4975	2.4402	45.54	2.790
2.800	0.3894	0.0368	0.0946	1.1051	0.3660	9.9324	1.2058	0.4898	0.2022	0.4882	0.3895	8.9800	10.5694	2.4512	45.75	2.800
2.810	0.3877	0.0363	0.0936	1.1066	0.3625	9.9896	1.2067	0.4915	0.2006	0.4875	0.3862	9.0455	10.6415	2.4622	45.95	2.810
2.820	0.3860	0.0357	0.0926	1.1081	0.3591	10.0470	1.2077	0.4932	0.1990	0.4868	0.3829	9.1111	10.7139	2.4733	46.16	2.820
2.830	0.3844	0.0352	0.0916	1.1096	0.3557	10.1046	1.2086	0.4949	0.1973	0.4861	0.3797	9.1771	10.7865	2.4844	46.37	2.830
2.840	0.3827	0.0347	0.0906	1.1111	0.3523	10.1624	1.2095	0.4966	0.1957	0.4854	0.3765	9.2432	10.8594	2.4955	46.57	2.840
2.850	0.3810	0.0341	0.0896	1.1126	0.3490	10.2204	1.2105	0.4983	0.1941	0.4847	0.3733	9.3096	10.9326	2.5067	46.78	2.850
2.860	0.3794	0.0336	0.0886	1.1141	0.3457	10.2785	1.2114	0.5000	0.1926	0.4840	0.3701	9.3762	11.0060	2.5179	46.98	2.860
2.870	0.3777	0.0331	0.0877	1.1156	0.3424	10.3368	1.2123	0.5016	0.1910	0.4833	0.3670	9.4431	11.0797	2.5292	47.19	2.870
2.880	0.3761	0.0326	0.0867	1.1171	0.3392	10.3954	1.2132	0.5033	0.1894	0.4827	0.3639	9.5101	11.1536	2.5405	47.39	2.880
2.890	0.3745	0.0321	0.0858	1.1185	0.3359	10.4541	1.2142	0.5049	0.1879	0.4820	0.3608	9.5775	11.2278	2.5518	47.59	2.890
2.900	0.3729	0.0317	0.0849	1.1199	0.3328	10.5130	1.2151	0.5065	0.1863	0.4814	0.3577	9.6450	11.3022	2.5632	47.79	2.900
2.910	0.3712	0.0312	0.0840	1.1214	0.3296	10.5720	1.2160	0.5081	0.1848	0.4807	0.3547	9.7128	11.3770	2.5746	47.99	2.910
2.920	0.3696	0.0307	0.0831	1.1228	0.3265	10.6313	1.2169	0.5097	0.1833	0.4801	0.3517	9.7808	11.4519	2.5861	48.19	2.920
2.930	0.3681	0.0302	0.0822	1.1242	0.3234	10.6908	1.2178	0.5113	0.1818	0.4795	0.3487	9.8491	11.5271	2.5976	48.39	2.930
2.940	0.3665	0.0298	0.0813	1.1256	0.3203	10.7504	1.2187	0.5129	0.1803	0.4788	0.3457	9.9175	11.6026	2.6091	48.59	2.940
2.950	0.3649	0.0293	0.0804	1.1270	0.3173	10.8102	1.2195	0.5145	0.1788	0.4782	0.3428	9.9863	11.6784	2.6206	48.78	2.950
2.960	0.3633	0.0289	0.0796	1.1284	0.3143	10.8702	1.2204	0.5160	0.1773	0.4776	0.3398	10.0552	11.7544	2.6322	48.98	2.960
2.970	0.3618	0.0285	0.0787	1.1298	0.3113	10.9304	1.2213	0.5176	0.1758	0.4770	0.3369	10.1244	11.8306	2.6439	49.18	2.970
2.980	0.3602	0.0281	0.0779	1.1312	0.3083	10.9908	1.2222	0.5191	0.1744	0.4764	0.3340	10.1938	11.9072	2.6555	49.37	2.980
2.990	0.3587	0.0276	0.0770	1.1325	0.3054	11.0514	1.2230	0.5206	0.1729	0.4758	0.3312	10.2635	11.9839	2.6673	49.56	2.990
3.000	0.3571	0.0272	0.0762	1.1339	0.3025	11.1122	1.2239	0.5222	0.1715	0.4752	0.3283	10.3333	12.0610	2.6790	49.76	3.000

## GAS FLOW TABLES ( $\gamma=1.333$ ): SUBSONIC FLOW

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{max}}{D}$	$\frac{1}{2}\rho V^2$ $p_0$
0.010	1.0000	0.9999	1.0000	0.0058	0.0231	0.0231	43.2958	7493.200	0.0001
0.020	0.9999	0.9997	0.9998	0.0115	0.0462	0.0462	21.6560	1868.007	0.0003
0.030	0.9999	0.9994	0.9996	0.0173	0.0693	0.0693	14.4464	826.7890	0.0006
0.040	0.9997	0.9989	0.9992	0.0231	0.0923	0.0924	10.8442	462.6179	0.0011
0.050	0.9996	0.9983	0.9988	0.0288	0.1153	0.1155	8.6851	294.2161	0.0017
0.060	0.9994	0.9976	0.9982	0.0346	0.1383	0.1386	7.2475	202.8455	0.0024
0.070	0.9992	0.9967	0.9976	0.0404	0.1612	0.1618	6.2222	147.8292	0.0033
0.080	0.9989	0.9957	0.9968	0.0461	0.1841	0.1849	5.4546	112.1800	0.0042
0.090	0.9987	0.9946	0.9960	0.0519	0.2069	0.2080	4.8587	87.7848	0.0054
0.100	0.9983	0.9934	0.9950	0.0577	0.2297	0.2312	4.3831	70.3719	0.0066
0.110	0.9980	0.9920	0.9940	0.0634	0.2523	0.2544	3.9949	57.5186	0.0080
0.120	0.9976	0.9905	0.9928	0.0692	0.2749	0.2775	3.6724	47.7680	0.0095
0.130	0.9972	0.9888	0.9916	0.0749	0.2974	0.3007	3.4003	40.2012	0.0111
0.140	0.9967	0.9870	0.9903	0.0807	0.3197	0.3239	3.1678	34.2155	0.0129
0.150	0.9963	0.9851	0.9888	0.0864	0.3420	0.3471	2.9670	29.4027	0.0148
0.160	0.9958	0.9831	0.9873	0.0921	0.3641	0.3704	2.7920	25.4777	0.0168
0.170	0.9952	0.9810	0.9857	0.0979	0.3861	0.3936	2.6383	22.2372	0.0189
0.180	0.9946	0.9787	0.9840	0.1036	0.4080	0.4169	2.5022	19.5326	0.0211
0.190	0.9940	0.9763	0.9822	0.1093	0.4298	0.4402	2.3809	17.2536	0.0235
0.200	0.9934	0.9738	0.9803	0.1150	0.4514	0.4635	2.2724	15.3166	0.0260
0.210	0.9927	0.9711	0.9783	0.1207	0.4728	0.4869	2.1747	13.6578	0.0285
0.220	0.9920	0.9684	0.9762	0.1264	0.4941	0.5102	2.0863	12.2273	0.0312
0.230	0.9913	0.9655	0.9740	0.1321	0.5152	0.5336	2.0061	10.9859	0.0340
0.240	0.9905	0.9625	0.9717	0.1378	0.5362	0.5570	1.9330	9.9026	0.0370
0.250	0.9897	0.9594	0.9694	0.1435	0.5569	0.5805	1.8662	8.9522	0.0400
0.260	0.9889	0.9562	0.9669	0.1492	0.5775	0.6040	1.8049	8.1146	0.0431
0.270	0.9880	0.9529	0.9644	0.1549	0.5979	0.6275	1.7486	7.3731	0.0463
0.280	0.9871	0.9494	0.9618	0.1605	0.6181	0.6510	1.6966	6.7140	0.0496
0.290	0.9862	0.9459	0.9591	0.1662	0.6380	0.6746	1.6486	6.1261	0.0530
0.300	0.9852	0.9422	0.9563	0.1718	0.6578	0.6982	1.6042	5.5998	0.0565
0.310	0.9843	0.9384	0.9534	0.1775	0.6774	0.7218	1.5629	5.1272	0.0601
0.320	0.9832	0.9346	0.9505	0.1831	0.6967	0.7455	1.5245	4.7016	0.0638
0.330	0.9822	0.9306	0.9475	0.1887	0.7158	0.7692	1.4888	4.3173	0.0675
0.340	0.9811	0.9265	0.9444	0.1943	0.7347	0.7929	1.4555	3.9693	0.0714
0.350	0.9800	0.9224	0.9412	0.1999	0.7533	0.8167	1.4244	3.6535	0.0753
0.360	0.9789	0.9181	0.9379	0.2055	0.7717	0.8405	1.3953	3.3663	0.0793
0.370	0.9777	0.9137	0.9346	0.2111	0.7898	0.8644	1.3680	3.1046	0.0834
0.380	0.9765	0.9093	0.9311	0.2167	0.8077	0.8883	1.3425	2.8655	0.0875
0.390	0.9753	0.9047	0.9276	0.2223	0.8253	0.9122	1.3185	2.6469	0.0917
0.400	0.9741	0.9001	0.9241	0.2278	0.8427	0.9362	1.2959	2.4466	0.0960
0.410	0.9728	0.8954	0.9204	0.2334	0.8598	0.9603	1.2747	2.2627	0.1003
0.420	0.9715	0.8906	0.9167	0.2389	0.8766	0.9843	1.2548	2.0937	0.1047
0.430	0.9701	0.8857	0.9130	0.2444	0.8932	1.0085	1.2360	1.9382	0.1091
0.440	0.9688	0.8807	0.9091	0.2499	0.9095	1.0326	1.2183	1.7949	0.1136
0.450	0.9674	0.8757	0.9052	0.2554	0.9255	1.0569	1.2016	1.6627	0.1182
0.460	0.9660	0.8706	0.9012	0.2609	0.9412	1.0811	1.1858	1.5405	0.1228
0.470	0.9645	0.8654	0.8972	0.2664	0.9567	1.1055	1.1710	1.4276	0.1274
0.480	0.9631	0.8601	0.8931	0.2718	0.9718	1.1299	1.1569	1.3231	0.1321
0.490	0.9616	0.8548	0.8890	0.2773	0.9867	1.1543	1.1436	1.2263	0.1368
0.500	0.9600	0.8494	0.8847	0.2827	1.0012	1.1788	1.1310	1.1365	0.1415

$$\gamma=1.333$$

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{A p_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{A p}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{\max}}{D}$	$\frac{1}{2}\rho V^2$ $p_0$
0.510	0.9585	0.8439	0.8805	0.2881	1.0155	1.2033	1.1192	1.0532	0.1463
0.520	0.9569	0.8384	0.8761	0.2935	1.0295	1.2279	1.1079	0.9759	0.1511
0.530	0.9553	0.8328	0.8717	0.2989	1.0431	1.2526	1.0973	0.9041	0.1559
0.540	0.9537	0.8271	0.8673	0.3043	1.0565	1.2773	1.0872	0.8373	0.1608
0.550	0.9520	0.8214	0.8628	0.3097	1.0696	1.3021	1.0777	0.7752	0.1656
0.560	0.9504	0.8157	0.8583	0.3150	1.0823	1.3269	1.0687	0.7174	0.1705
0.570	0.9487	0.8099	0.8537	0.3204	1.0948	1.3518	1.0601	0.6636	0.1754
0.580	0.9470	0.8040	0.8490	0.3257	1.1069	1.3768	1.0520	0.6136	0.1803
0.590	0.9452	0.7981	0.8443	0.3310	1.1188	1.4018	1.0444	0.5669	0.1852
0.600	0.9434	0.7921	0.8396	0.3363	1.1303	1.4269	1.0371	0.5235	0.1901
0.610	0.9417	0.7861	0.8348	0.3416	1.1415	1.4521	1.0303	0.4830	0.1950
0.620	0.9398	0.7801	0.8300	0.3469	1.1524	1.4773	1.0238	0.4452	0.1999
0.630	0.9380	0.7740	0.8252	0.3521	1.1630	1.5026	1.0176	0.4101	0.2048
0.640	0.9362	0.7679	0.8203	0.3573	1.1733	1.5280	1.0118	0.3773	0.2096
0.650	0.9343	0.7618	0.8153	0.3626	1.1833	1.5534	1.0063	0.3467	0.2145
0.660	0.9324	0.7556	0.8104	0.3678	1.1930	1.5789	1.0011	0.3183	0.2194
0.670	0.9305	0.7494	0.8054	0.3729	1.2023	1.6045	0.9962	0.2918	0.2242
0.680	0.9285	0.7431	0.8003	0.3781	1.2114	1.6301	0.9916	0.2671	0.2290
0.690	0.9266	0.7368	0.7953	0.3833	1.2201	1.6559	0.9872	0.2441	0.2338
0.700	0.9246	0.7306	0.7902	0.3884	1.2285	1.6817	0.9831	0.2227	0.2386
0.710	0.9226	0.7242	0.7850	0.3935	1.2367	1.7075	0.9792	0.2028	0.2433
0.720	0.9205	0.7179	0.7799	0.3986	1.2445	1.7335	0.9755	0.1843	0.2480
0.730	0.9185	0.7116	0.7747	0.4037	1.2520	1.7595	0.9721	0.1671	0.2527
0.740	0.9164	0.7052	0.7695	0.4088	1.2592	1.7856	0.9688	0.1512	0.2574
0.750	0.9144	0.6988	0.7643	0.4139	1.2661	1.8118	0.9658	0.1364	0.2620
0.760	0.9123	0.6924	0.7590	0.4189	1.2727	1.8381	0.9629	0.1227	0.2666
0.770	0.9102	0.6860	0.7537	0.4239	1.2790	1.8644	0.9603	0.1100	0.2711
0.780	0.9080	0.6796	0.7484	0.4289	1.2850	1.8908	0.9578	0.0983	0.2756
0.790	0.9059	0.6732	0.7431	0.4339	1.2907	1.9174	0.9554	0.0875	0.2800
0.800	0.9037	0.6668	0.7378	0.4389	1.2961	1.9440	0.9533	0.0776	0.2844
0.810	0.9015	0.6603	0.7325	0.4438	1.3013	1.9706	0.9513	0.0685	0.2888
0.820	0.8993	0.6539	0.7271	0.4487	1.3061	1.9974	0.9494	0.0601	0.2930
0.830	0.8971	0.6475	0.7217	0.4536	1.3107	2.0243	0.9477	0.0524	0.2973
0.840	0.8949	0.6411	0.7164	0.4585	1.3149	2.0512	0.9461	0.0454	0.3015
0.850	0.8926	0.6346	0.7110	0.4634	1.3189	2.0782	0.9446	0.0391	0.3056
0.860	0.8904	0.6282	0.7056	0.4683	1.3226	2.1053	0.9433	0.0333	0.3097
0.870	0.8881	0.6218	0.7002	0.4731	1.3260	2.1326	0.9420	0.0281	0.3137
0.880	0.8858	0.6154	0.6948	0.4779	1.3292	2.1599	0.9409	0.0235	0.3176
0.890	0.8835	0.6090	0.6893	0.4827	1.3321	2.1873	0.9399	0.0193	0.3215
0.900	0.8812	0.6026	0.6839	0.4875	1.3347	2.2147	0.9390	0.0156	0.3253
0.910	0.8788	0.5963	0.6785	0.4923	1.3370	2.2423	0.9383	0.0124	0.3291
0.920	0.8765	0.5899	0.6731	0.4970	1.3391	2.2700	0.9376	0.0096	0.3328
0.930	0.8741	0.5836	0.6676	0.5018	1.3410	2.2978	0.9370	0.0072	0.3364
0.940	0.8717	0.5773	0.6622	0.5065	1.3425	2.3256	0.9365	0.0052	0.3400
0.950	0.8694	0.5710	0.6568	0.5111	1.3439	2.3536	0.9360	0.0035	0.3435
0.960	0.8670	0.5647	0.6514	0.5158	1.3449	2.3817	0.9357	0.0022	0.3469
0.970	0.8646	0.5585	0.6459	0.5205	1.3458	2.4098	0.9354	0.0012	0.3502
0.980	0.8621	0.5522	0.6405	0.5251	1.3464	2.4381	0.9353	0.0005	0.3535
0.990	0.8597	0.5460	0.6351	0.5297	1.3467	2.4664	0.9351	0.0001	0.3567
1.000	0.8573	0.5398	0.6297	0.5343	1.3468	2.4949	0.9351	0.0000	0.3598

# GAS FLOW TABLES ( $\gamma=1.333$ ): SUPERSONIC FLOW

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{max}}{D}$	$\frac{1}{2}\frac{\rho V^2}{p_0}$
1.010	0.8548	0.5337	0.6243	0.5389	1.3467	2.5234	0.9351	0.0001	0.3628
1.020	0.8524	0.5276	0.6189	0.5434	1.3464	2.5521	0.9352	0.0005	0.3658
1.030	0.8499	0.5215	0.6136	0.5479	1.3458	2.5809	0.9354	0.0011	0.3687
1.040	0.8474	0.5154	0.6082	0.5525	1.3450	2.6097	0.9356	0.0019	0.3715
1.050	0.8449	0.5093	0.6028	0.5569	1.3440	2.6387	0.9359	0.0029	0.3743
1.060	0.8424	0.5033	0.5975	0.5614	1.3428	2.6678	0.9363	0.0042	0.3769
1.070	0.8399	0.4974	0.5922	0.5659	1.3414	2.6970	0.9367	0.0056	0.3795
1.080	0.8374	0.4914	0.5869	0.5703	1.3397	2.7263	0.9371	0.0071	0.3820
1.090	0.8349	0.4855	0.5816	0.5747	1.3379	2.7557	0.9376	0.0089	0.3845
1.100	0.8323	0.4796	0.5763	0.5791	1.3359	2.7852	0.9381	0.0108	0.3868
1.110	0.8298	0.4738	0.5710	0.5835	1.3337	2.8148	0.9387	0.0128	0.3891
1.120	0.8272	0.4680	0.5658	0.5878	1.3313	2.8446	0.9394	0.0150	0.3913
1.130	0.8247	0.4622	0.5605	0.5922	1.3287	2.8744	0.9401	0.0173	0.3934
1.140	0.8221	0.4565	0.5553	0.5965	1.3259	2.9043	0.9408	0.0197	0.3954
1.150	0.8195	0.4508	0.5501	0.6008	1.3229	2.9344	0.9415	0.0223	0.3974
1.160	0.8170	0.4452	0.5449	0.6050	1.3198	2.9646	0.9424	0.0250	0.3993
1.170	0.8144	0.4396	0.5398	0.6093	1.3165	2.9949	0.9432	0.0277	0.4011
1.180	0.8118	0.4340	0.5347	0.6135	1.3131	3.0253	0.9441	0.0306	0.4028
1.190	0.8092	0.4285	0.5295	0.6177	1.3094	3.0558	0.9450	0.0335	0.4044
1.200	0.8066	0.4230	0.5245	0.6219	1.3057	3.0864	0.9459	0.0366	0.4060
1.210	0.8040	0.4176	0.5194	0.6261	1.3017	3.1172	0.9469	0.0397	0.4075
1.220	0.8014	0.4122	0.5143	0.6302	1.2976	3.1481	0.9479	0.0429	0.4089
1.230	0.7988	0.4068	0.5093	0.6344	1.2934	3.1791	0.9489	0.0462	0.4102
1.240	0.7962	0.4015	0.5043	0.6385	1.2890	3.2102	0.9500	0.0495	0.4115
1.250	0.7936	0.3963	0.4994	0.6426	1.2845	3.2414	0.9511	0.0529	0.4127
1.260	0.7909	0.3911	0.4944	0.6466	1.2798	3.2727	0.9522	0.0564	0.4138
1.270	0.7883	0.3859	0.4895	0.6507	1.2751	3.3042	0.9533	0.0599	0.4148
1.280	0.7857	0.3808	0.4846	0.6547	1.2701	3.3358	0.9545	0.0634	0.4158
1.290	0.7830	0.3757	0.4798	0.6587	1.2651	3.3675	0.9557	0.0670	0.4167
1.300	0.7804	0.3706	0.4749	0.6627	1.2599	3.3993	0.9569	0.0707	0.4175
1.310	0.7778	0.3657	0.4701	0.6667	1.2547	3.4313	0.9581	0.0744	0.4182
1.320	0.7751	0.3607	0.4654	0.6706	1.2493	3.4633	0.9594	0.0781	0.4189
1.330	0.7725	0.3558	0.4606	0.6746	1.2438	3.4955	0.9606	0.0819	0.4195
1.340	0.7698	0.3510	0.4559	0.6785	1.2382	3.5279	0.9619	0.0857	0.4200
1.350	0.7672	0.3462	0.4512	0.6824	1.2325	3.5603	0.9632	0.0895	0.4205
1.360	0.7646	0.3414	0.4465	0.6862	1.2266	3.5929	0.9645	0.0934	0.4209
1.370	0.7619	0.3367	0.4419	0.6901	1.2207	3.6256	0.9659	0.0973	0.4212
1.380	0.7593	0.3320	0.4373	0.6939	1.2147	3.6584	0.9672	0.1012	0.4215
1.390	0.7566	0.3274	0.4328	0.6977	1.2086	3.6914	0.9686	0.1051	0.4216
1.400	0.7540	0.3229	0.4282	0.7015	1.2025	3.7245	0.9700	0.1091	0.4218
1.410	0.7513	0.3183	0.4237	0.7053	1.1962	3.7577	0.9714	0.1130	0.4218
1.420	0.7487	0.3139	0.4192	0.7090	1.1899	3.7910	0.9728	0.1170	0.4218
1.430	0.7460	0.3094	0.4148	0.7127	1.1835	3.8245	0.9742	0.1210	0.4217
1.440	0.7434	0.3051	0.4104	0.7164	1.1770	3.8581	0.9756	0.1250	0.4216
1.450	0.7407	0.3007	0.4060	0.7201	1.1704	3.8918	0.9771	0.1290	0.4214
1.460	0.7381	0.2965	0.4017	0.7238	1.1638	3.9257	0.9785	0.1331	0.4212
1.470	0.7354	0.2922	0.3974	0.7275	1.1571	3.9597	0.9800	0.1371	0.4209
1.480	0.7328	0.2880	0.3931	0.7311	1.1504	3.9938	0.9815	0.1411	0.4205
1.490	0.7301	0.2839	0.3888	0.7347	1.1435	4.0281	0.9829	0.1452	0.4201
1.500	0.7275	0.2798	0.3846	0.7383	1.1367	4.0625	0.9844	0.1492	0.4196

$$\gamma=1.333$$

$M$	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	$\frac{V}{\sqrt{c_p T_0}}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap_0}$	$\frac{\dot{m}\sqrt{c_p T_0}}{Ap}$	$\frac{F}{\dot{m}\sqrt{c_p T_0}}$	$\frac{4c_f L_{max}}{D}$	$\frac{1}{2}\rho V^2$ $p_0$
1.510	0.7248	0.2758	0.3804	0.7419	1.1298	4.0970	0.9859	0.1532	0.4191
1.520	0.7222	0.2718	0.3763	0.7454	1.1228	4.1317	0.9874	0.1573	0.4185
1.530	0.7195	0.2678	0.3722	0.7489	1.1158	4.1665	0.9889	0.1613	0.4178
1.540	0.7169	0.2639	0.3681	0.7524	1.1087	4.2014	0.9905	0.1654	0.4171
1.550	0.7143	0.2600	0.3641	0.7559	1.1016	4.2365	0.9920	0.1694	0.4164
1.560	0.7116	0.2562	0.3600	0.7594	1.0945	4.2717	0.9935	0.1734	0.4156
1.570	0.7090	0.2524	0.3561	0.7629	1.0873	4.3070	0.9950	0.1775	0.4147
1.580	0.7064	0.2487	0.3521	0.7663	1.0801	4.3425	0.9966	0.1815	0.4138
1.590	0.7038	0.2450	0.3482	0.7697	1.0729	4.3782	0.9981	0.1855	0.4129
1.600	0.7011	0.2414	0.3443	0.7731	1.0656	4.4139	0.9997	0.1895	0.4119
1.610	0.6985	0.2378	0.3405	0.7765	1.0583	4.4498	1.0012	0.1935	0.4109
1.620	0.6959	0.2343	0.3367	0.7799	1.0510	4.4859	1.0028	0.1975	0.4098
1.630	0.6933	0.2308	0.3329	0.7832	1.0436	4.5220	1.0043	0.2015	0.4087
1.640	0.6907	0.2273	0.3291	0.7865	1.0363	4.5584	1.0059	0.2055	0.4075
1.650	0.6881	0.2239	0.3254	0.7898	1.0289	4.5948	1.0075	0.2094	0.4063
1.660	0.6855	0.2206	0.3217	0.7931	1.0215	4.6314	1.0090	0.2134	0.4051
1.670	0.6829	0.2172	0.3181	0.7964	1.0141	4.6682	1.0106	0.2173	0.4038
1.680	0.6803	0.2139	0.3145	0.7996	1.0066	4.7051	1.0122	0.2213	0.4025
1.690	0.6777	0.2107	0.3109	0.8028	0.9992	4.7421	1.0137	0.2252	0.4011
1.700	0.6751	0.2075	0.3074	0.8061	0.9918	4.7793	1.0153	0.2291	0.3997
1.710	0.6726	0.2044	0.3039	0.8093	0.9843	4.8166	1.0169	0.2330	0.3983
1.720	0.6700	0.2012	0.3004	0.8124	0.9769	4.8541	1.0184	0.2369	0.3968
1.730	0.6674	0.1982	0.2969	0.8156	0.9694	4.8917	1.0200	0.2407	0.3953
1.740	0.6649	0.1951	0.2935	0.8187	0.9620	4.9294	1.0216	0.2446	0.3938
1.750	0.6623	0.1922	0.2901	0.8218	0.9545	4.9673	1.0232	0.2484	0.3922
1.760	0.6597	0.1892	0.2868	0.8249	0.9471	5.0054	1.0247	0.2522	0.3906
1.770	0.6572	0.1863	0.2835	0.8280	0.9396	5.0435	1.0263	0.2560	0.3890
1.780	0.6546	0.1834	0.2802	0.8311	0.9322	5.0819	1.0279	0.2598	0.3874
1.790	0.6521	0.1806	0.2770	0.8341	0.9248	5.1204	1.0294	0.2636	0.3857
1.800	0.6496	0.1778	0.2737	0.8372	0.9173	5.1590	1.0310	0.2673	0.3840
1.810	0.6471	0.1751	0.2706	0.8402	0.9099	5.1978	1.0326	0.2711	0.3822
1.820	0.6445	0.1723	0.2674	0.8432	0.9025	5.2367	1.0341	0.2748	0.3805
1.830	0.6420	0.1697	0.2643	0.8461	0.8951	5.2758	1.0357	0.2785	0.3787
1.840	0.6395	0.1670	0.2612	0.8491	0.8878	5.3150	1.0373	0.2822	0.3769
1.850	0.6370	0.1644	0.2581	0.8521	0.8804	5.3544	1.0388	0.2858	0.3751
1.860	0.6345	0.1619	0.2551	0.8550	0.8731	5.3939	1.0404	0.2895	0.3732
1.870	0.6320	0.1593	0.2521	0.8579	0.8658	5.4336	1.0419	0.2931	0.3714
1.880	0.6295	0.1568	0.2491	0.8608	0.8585	5.4734	1.0435	0.2967	0.3695
1.890	0.6271	0.1544	0.2462	0.8636	0.8512	5.5134	1.0450	0.3003	0.3676
1.900	0.6246	0.1520	0.2433	0.8665	0.8439	5.5535	1.0466	0.3039	0.3656
1.910	0.6221	0.1496	0.2404	0.8693	0.8367	5.5938	1.0481	0.3074	0.3637
1.920	0.6197	0.1472	0.2376	0.8722	0.8295	5.6342	1.0497	0.3110	0.3617
1.930	0.6172	0.1449	0.2348	0.8750	0.8223	5.6748	1.0512	0.3145	0.3598
1.940	0.6148	0.1426	0.2320	0.8778	0.8152	5.7155	1.0527	0.3180	0.3578
1.950	0.6123	0.1404	0.2292	0.8805	0.8081	5.7564	1.0543	0.3215	0.3558
1.960	0.6099	0.1382	0.2265	0.8833	0.8010	5.7974	1.0558	0.3249	0.3537
1.970	0.6075	0.1360	0.2238	0.8860	0.7939	5.8386	1.0573	0.3284	0.3517
1.980	0.6051	0.1338	0.2212	0.8888	0.7869	5.8800	1.0588	0.3318	0.3497
1.990	0.6026	0.1317	0.2185	0.8915	0.7799	5.9215	1.0603	0.3352	0.3476
2.000	0.6002	0.1296	0.2159	0.8942	0.7729	5.9631	1.0619	0.3386	0.3455



### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
1.05	0.558	79.937	1.0803	1.0567	1.0223	0.9845	0.99995	1.40	8.000	75.893	1.9842	1.6163	1.2276	0.8184	0.96806
1.10	1.515	76.297	1.1658	1.1157	1.0449	0.9711	0.99963		6.000	80.485	2.0575	1.6562	1.2423	0.7762	0.96286
									4.000	83.988	2.0949	1.6763	1.2497	0.7545	0.96009
									2.000	87.075	2.1140	1.6865	1.2535	0.7432	0.95865
1.15	2.000	67.003	1.1408	1.0986	1.0384	1.0434	0.99977	1.45	2.000	46.004	1.1028	1.0723	1.0284	1.3808	0.99990
	2.671	73.822	1.2565	1.1767	1.0678	0.9598	0.99879		4.000	48.679	1.2169	1.1503	1.0579	1.3091	0.99923
	2.000	81.173	1.3399	1.2316	1.0880	0.9007	0.99745		6.000	51.755	1.3463	1.2357	1.0895	1.2325	0.99733
									8.000	55.517	1.5000	1.3333	1.1250	1.1460	0.99325
1.20	2.000	61.050	1.1197	1.0841	1.0329	1.1113	0.99985	10.000	10.000	61.046	1.7114	1.4613	1.1712	1.0317	0.98440
	3.944	71.977	1.3525	1.2397	1.0910	0.9502	0.99720	10.785	10.785	67.097	1.9147	1.5779	1.2135	0.9235	0.97269
	2.000	83.861	1.4941	1.3297	1.1237	0.8551	0.99344	10.000	10.000	72.994	2.0764	1.6664	1.2461	0.8366	0.96147
								8.000	8.000	78.197	2.1836	1.7232	1.2672	0.7777	0.95324
								6.000	6.000	81.733	2.2355	1.7501	1.2774	0.7485	0.94905
1.25	2.000	56.844	1.1110	1.0780	1.0306	1.1696	0.99988	4.000	4.000	84.702	2.2653	1.7654	1.2832	0.7316	0.94659
	4.000	61.986	1.2541	1.1752	1.0672	1.0721	0.99882	2.000	2.000	87.406	2.2812	1.7736	1.2862	0.7225	0.94526
	5.286	70.540	1.4539	1.3045	1.1146	0.9423	0.99468								
	4.000	79.385	1.5944	1.3913	1.1459	0.8525	0.98975								
	2.000	85.211	1.6435	1.4210	1.1566	0.8209	0.98763								
1.30	2.000	53.474	1.1065	1.0749	1.0294	1.2244	0.99989	1.50	2.000	44.065	1.1030	1.0725	1.0284	1.4316	0.99990
	4.000	57.423	1.2334	1.1613	1.0621	1.1398	0.99906		4.000	46.543	1.2165	1.1500	1.0578	1.3615	0.99923
	6.000	63.459	1.4113	1.2775	1.1048	1.0274	0.99585		6.000	49.326	1.3433	1.2337	1.0888	1.2879	0.99739
	6.662	69.395	1.5608	1.3709	1.1386	0.9359	0.99108		8.000	52.571	1.4887	1.3263	1.1224	1.2079	0.99362
	6.000	75.372	1.6793	1.4423	1.1643	0.8636	0.98598		10.000	56.679	1.6662	1.4345	1.1615	1.1144	0.98660
	4.000	81.649	1.7634	1.4917	1.1822	0.8118	0.98169		12.000	64.359	1.9668	1.6068	1.2241	0.9607	0.96925
	2.000	86.058	1.7957	1.5103	1.1889	0.7918	0.97990		12.113	66.589	2.0439	1.6489	1.2396	0.9213	0.96385
									10.000	68.790	2.1147	1.6869	1.2537	0.8849	0.95860
									8.000	75.995	2.3046	1.7855	1.2908	0.7854	0.94329
									6.000	82.662	2.3746	1.8207	1.3042	0.7476	0.93725
									4.000	85.256	2.4155	1.8410	1.3121	0.7250	0.93363
									2.000	87.668	2.4404	1.8533	1.3168	0.7112	0.93141
															0.93018
1.35	2.000	50.634	1.1042	1.0733	1.0287	1.2774	0.99990								
	4.000	53.965	1.2238	1.1549	1.0596	1.1994	0.99916								
	6.000	58.232	1.3702	1.2512	1.0952	1.1089	0.99682	1.55	2.000	42.315	1.1036	1.0729	1.0286	1.4821	0.99990
	8.000	66.914	1.6327	1.4145	1.1543	0.9543	0.98812		4.000	44.642	1.2173	1.1505	1.0580	1.4130	0.99923
	8.048	68.470	1.6732	1.4387	1.1630	0.9307	0.98627		6.000	47.214	1.3430	1.2336	1.0887	1.3414	0.99739
	8.000	70.023	1.7114	1.4613	1.1712	0.9085	0.98440		8.000	50.131	1.4845	1.3236	1.1215	1.2651	0.99375
	6.000	78.660	1.8774	1.5569	1.2058	0.8111	0.97506		10.000	53.598	1.6491	1.4243	1.1578	1.1804	0.98738
	4.000	83.028	1.9283	1.5854	1.2163	0.7807	0.97182		12.000	58.240	1.8597	1.5469	1.2022	1.0758	0.97615
	2.000	86.644	1.9523	1.5988	1.2211	0.7662	0.97023		13.403	66.171	2.1787	1.7206	1.2663	0.9198	0.95362
									12.000	73.688	2.4151	1.8408	1.3120	0.8014	0.93367
									10.000	77.804	2.5112	1.8877	1.3302	0.7515	0.92496
1.40	2.000	48.173	1.1030	1.0725	1.0284	1.3295	0.99990		8.000	80.825	2.5650	1.9136	1.3404	0.7229	0.91995
	4.000	51.117	1.2189	1.1516	1.0584	1.2553	0.99921		6.000	83.385	2.5991	1.9298	1.3468	0.7045	0.91673
	6.000	54.633	1.3539	1.2406	1.0913	1.1737	0.99717		4.000	85.699	2.6205	1.9399	1.3508	0.6928	0.91470
	8.000	59.367	1.5263	1.3496	1.1309	1.0744	0.99235		2.000	87.879	2.6324	1.9455	1.3531	0.6862	0.91356
	9.427	67.716	1.7912	1.5077	1.1880	0.9266	0.98016								

Oblique Shock p1



### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
1.85	2.000	34.466	1.1121	1.0788	1.0309	1.7805	0.99988	1.95	2.000	32.528	1.1160	1.0815	1.0319	1.8790	0.99987
	4.000	36.323	1.2343	1.1619	1.0623	1.7114	0.99905		4.000	34.304	1.2424	1.1674	1.0643	1.8085	0.99896
	6.000	38.302	1.3672	1.2492	1.0945	1.6418	0.99689		6.000	36.191	1.3801	1.2575	1.0975	1.7380	0.99660
	8.000	40.424	1.5123	1.3409	1.1278	1.5711	0.99284		8.000	38.204	1.5302	1.3521	1.1318	1.6666	0.99221
	10.000	42.717	1.6709	1.4373	1.1625	1.4983	0.98638		10.000	40.360	1.6938	1.4509	1.1674	1.5938	0.98528
	12.000	45.223	1.8453	1.5388	1.1992	1.4224	0.97701		12.000	42.688	1.8726	1.5542	1.2049	1.5185	0.97535
	14.000	48.014	2.0395	1.6465	1.2387	1.3415	0.96417		14.000	45.230	2.0693	1.6625	1.2446	1.4396	0.96200
	16.000	51.232	2.2607	1.7631	1.2822	1.2524	0.94697		16.000	48.059	2.2879	1.7770	1.2875	1.3553	0.94470
	18.000	55.227	2.5275	1.8956	1.3333	1.1476	0.92345		18.000	51.320	2.5368	1.9001	1.3351	1.2622	0.92258
	20.000	62.089	2.9519	2.0902	1.4123	0.9818	0.88189		20.000	55.381	2.8378	2.0397	1.3913	1.1520	0.89342
	20.198	64.872	3.1062	2.1565	1.4404	0.9205	0.86601		22.000	62.860	3.3464	2.2553	1.4838	0.9655	0.84087
	20.000	67.544	3.2437	2.2136	1.4653	0.8648	0.85167		22.092	64.716	3.4603	2.3003	1.5043	0.9229	0.82885
	18.000	73.440	3.5019	2.3165	1.5117	0.7560	0.82446		22.000	66.523	3.5655	2.3410	1.5231	0.8829	0.81774
	16.000	76.511	3.6090	2.3576	1.5308	0.7085	0.81314		20.000	72.926	3.8872	2.4601	1.5801	0.7555	0.78384
	14.000	78.861	3.6772	2.3833	1.5429	0.6773	0.80593		18.000	75.964	4.0086	2.5030	1.6015	0.7045	0.77114
	12.000	80.844	3.7252	2.4011	1.5514	0.6548	0.80088		16.000	78.253	4.0857	2.5297	1.6151	0.6710	0.76313
10.000	82.606	3.7601	2.4140	1.5576	0.6381	0.79719		14.000	80.165	4.1401	2.5484	1.6246	0.6467	0.75750	
8.000	84.222	3.7858	2.4234	1.5622	0.6257	0.79449		12.000	81.849	4.1804	2.5620	1.6317	0.6283	0.75335	
6.000	85.740	3.8042	2.4301	1.5655	0.6166	0.79255		10.000	83.381	4.2106	2.5722	1.6370	0.6142	0.75024	
4.000	87.193	3.8167	2.4346	1.5677	0.6105	0.79124		8.000	84.808	4.2333	2.5798	1.6409	0.6036	0.74791	
2.000	88.606	3.8239	2.4373	1.5689	0.6069	0.79048		6.000	86.163	4.2497	2.5853	1.6438	0.5957	0.74623	
								4.000	87.467	4.2609	2.5890	1.6458	0.5904	0.74508	
								2.000	88.741	4.2674	2.5912	1.6469	0.5872	0.74441	
1.90	2.000	33.466	1.1140	1.0801	1.0314	1.8298	0.99987	2.00	2.000	31.647	1.1180	1.0829	1.0324	1.9280	0.99986
	4.000	35.279	1.2382	1.1646	1.0633	1.7600	0.99901		4.000	33.390	1.2468	1.1702	1.0654	1.8568	0.99891
	6.000	37.209	1.3735	1.2533	1.0959	1.6901	0.99675		6.000	35.241	1.3871	1.2620	1.0991	1.7856	0.99644
	8.000	39.272	1.5209	1.3463	1.1297	1.6191	0.99254		8.000	37.210	1.5400	1.3581	1.1339	1.7138	0.99186
	10.000	41.490	1.6818	1.4438	1.1649	1.5464	0.98586		10.000	39.314	1.7066	1.4584	1.1702	1.6405	0.98464
	12.000	43.898	1.8582	1.5460	1.2019	1.4709	0.97624		12.000	41.575	1.8884	1.5631	1.2081	1.5651	0.97437
	14.000	46.550	2.0530	1.6538	1.2414	1.3913	0.96319		14.000	44.029	2.0876	1.6724	1.2483	1.4866	0.96064
	16.000	49.544	2.2718	1.7688	1.2844	1.3052	0.94605		16.000	46.731	2.3076	1.7870	1.2913	1.4034	0.94304
	18.000	53.095	2.5263	1.8951	1.3331	1.2077	0.92356		18.000	49.785	2.5546	1.9086	1.3384	1.3131	0.92092
	20.000	57.900	2.8557	2.0477	1.3946	1.0835	0.89162		20.000	53.423	2.8429	2.0420	1.3922	1.2102	0.89291
	21.167	64.783	3.2805	2.2286	1.4720	0.9216	0.84781		22.000	58.457	3.2228	2.2051	1.4616	1.0760	0.85385
	18.000	71.057	3.6012	2.3546	1.5294	0.7935	0.79744		22.974	64.669	3.6458	2.3715	1.5373	0.9243	0.80926
	16.000	74.861	3.7578	2.4131	1.5572	0.7274	0.77721		22.000	70.332	3.9714	2.4899	1.5950	0.8017	0.77503
	14.000	79.565	3.8466	2.4455	1.5729	0.6884	0.78810		20.000	74.270	4.1570	2.5541	1.6276	0.7278	0.75576
	12.000	81.383	3.9504	2.4671	1.5836	0.6611	0.77721		18.000	78.921	4.3277	2.6110	1.6574	0.6558	0.73827
	10.000	83.020	3.9828	2.4940	1.5970	0.6257	0.77383		16.000	80.684	4.3777	2.6274	1.6662	0.6337	0.73319
8.000	84.534	4.0068	2.5024	1.6012	0.6142	0.77133		14.000	82.257	4.4153	2.6396	1.6727	0.6168	0.72939	
6.000	85.965	4.0241	2.5084	1.6042	0.6058	0.76953		12.000	83.700	4.4438	2.6487	1.6777	0.6037	0.72652	
4.000	87.338	4.0359	2.5125	1.6063	0.6001	0.76830		10.000	85.052	4.4653	2.6556	1.6815	0.5937	0.72436	
2.000	88.677	4.0428	2.5149	1.6075	0.5967	0.76759		8.000	86.339	4.4810	2.6606	1.6842	0.5864	0.72278	
								6.000	87.582	4.4917	2.6640	1.6861	0.5813	0.72171	
								4.000	88.798	4.4979	2.6660	1.6871	0.5783	0.72108	

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$
2.05	2.000	30.816	1.1200	1.0843	1.0330	1.9771	0.99985	2.10	4.000	87.778	4.9706	2.8097	1.7691	0.5648	0.67494
	4.000	32.532	1.2512	1.1732	1.0665	1.9050	0.99885	2.000	2.000	88.894	4.9764	2.8113	1.7701	0.5622	0.67438
	6.000	34.350	1.3943	1.2666	1.1008	1.8330	0.99627								
	8.000	36.281	1.5502	1.3644	1.1362	1.7605	0.99148								
	10.000	38.341	1.7201	1.4664	1.1730	1.6868	0.98396	2.15	2.000	29.293	1.1243	1.0872	1.0341	2.0749	0.99984
	12.000	40.547	1.9053	1.5726	1.2116	1.6111	0.97330	4.000	4.000	30.960	1.2606	1.1794	1.0688	2.0008	0.99874
	14.000	42.928	2.1076	1.6831	1.2522	1.5326	0.95914	6.000	6.000	32.725	1.4094	1.2763	1.1043	1.9271	0.99590
	16.000	45.528	2.3300	1.7983	1.2956	1.4500	0.94112	8.000	8.000	34.596	1.5719	1.3777	1.1410	1.8529	0.99065
	18.000	48.428	2.5774	1.9195	1.3427	1.3614	0.91878	10.000	10.000	36.584	1.7490	1.4833	1.1791	1.7778	0.98246
	20.000	51.785	2.8600	2.0497	1.3953	1.2630	0.89120	12.000	12.000	38.702	1.9417	1.5929	1.2190	1.7011	0.97093
	22.000	56.032	3.2057	2.1980	1.4585	1.1444	0.85565	14.000	14.000	40.971	2.1518	1.7065	1.2610	1.6221	0.95574
	23.814	64.638	3.8367	2.4419	1.5712	0.9257	0.78913	16.000	16.000	43.422	2.3813	1.8241	1.3055	1.5397	0.93666
	20.000	72.193	4.2777	2.5946	1.6487	0.7626	0.74336	18.000	18.000	46.104	2.6337	1.9461	1.3533	1.4527	0.91343
	20.000	75.324	4.4215	2.6416	1.6738	0.7056	0.72876	20.000	20.000	49.106	2.9150	2.0740	1.4055	1.4055	0.88564
	18.000	77.614	4.5107	2.6700	1.6894	0.6688	0.71981	22.000	22.000	52.618	3.2384	2.2115	1.4644	1.2534	0.85222
	16.000	79.498	4.5734	2.6898	1.7003	0.6422	0.71356	24.000	24.000	57.217	3.6452	2.3712	1.5372	1.1223	0.80932
	14.000	81.138	4.6199	2.7043	1.7084	0.6219	0.70894	25.376	25.376	64.616	4.2352	2.5804	1.6413	0.9289	0.74772
	12.000	82.617	4.6553	2.7152	1.7145	0.6062	0.70545	24.000	24.000	71.164	4.6641	2.7180	1.7160	0.7794	0.70458
10.000	83.983	4.6824	2.7236	1.7192	0.5939	0.70278	22.000	22.000	74.564	4.8442	2.7725	1.7472	0.7122	0.68703	
8.000	85.269	4.7029	2.7299	1.7228	0.5846	0.70077	20.000	20.000	76.920	4.9500	2.8037	1.7656	0.6709	0.67689	
6.000	86.497	4.7179	2.7344	1.7254	0.5776	0.69930	18.000	18.000	78.817	5.0234	2.8249	1.7782	0.6413	0.66994	
4.000	87.685	4.7283	2.7376	1.7272	0.5728	0.69829	16.000	16.000	80.444	5.0776	2.8405	1.7876	0.6188	0.66484	
2.000	88.849	4.7343	2.7394	1.7282	0.5700	0.69770	14.000	14.000	81.896	5.1191	2.8523	1.7947	0.6012	0.66097	
															0.65798
2.10	2.000	30.033	1.1222	1.0858	1.0335	2.0260	0.99984	2.20	2.000	28.592	1.1266	1.0888	1.0347	2.1237	0.99983
	4.000	31.723	1.2558	1.1763	1.0676	1.9530	0.99880	4.000	4.000	30.238	1.2654	1.1826	1.0700	2.0485	0.99867
	6.000	33.513	1.4017	1.2714	1.1025	1.8801	0.99609	6.000	6.000	31.981	1.4173	1.2813	1.1061	1.9738	0.99569
	8.000	35.412	1.5608	1.3709	1.1386	1.8069	0.99108	8.000	8.000	33.827	1.5832	1.3845	1.1435	1.8987	0.99020
	10.000	37.433	1.7342	1.4746	1.1760	1.7325	0.98324	10.000	10.000	35.785	1.7641	1.4921	1.1823	1.8228	0.98165
	12.000	39.592	1.9230	1.5825	1.2152	1.6564	0.97216	12.000	12.000	37.869	1.9611	1.6036	1.2229	1.7454	0.96964
	14.000	41.912	2.1290	1.6944	1.2565	1.5777	0.95750	14.000	14.000	40.095	2.1756	1.7190	1.2656	1.6657	0.95387
	16.000	44.430	2.3547	1.8107	1.3004	1.4954	0.93899	16.000	16.000	42.489	2.4095	1.8380	1.3109	1.5831	0.93417
	18.000	47.210	2.6041	1.9322	1.3478	1.4078	0.91626	18.000	18.000	45.092	2.6658	1.9611	1.3593	1.4963	0.91035
	20.000	50.365	2.8848	2.0607	1.3999	1.3122	0.88870	20.000	20.000	47.975	2.9494	2.0891	1.4118	1.4035	0.88215
	22.000	54.169	3.2152	2.2019	1.4602	1.2019	0.85466	22.000	22.000	51.277	3.2704	2.2245	1.4701	1.3013	0.84887
	24.000	59.767	3.6739	2.3820	1.5424	1.0493	0.80628	24.000	24.000	55.356	3.6552	2.3750	1.5390	1.1805	0.80826
	24.614	64.621	4.0332	2.5116	1.6058	0.9273	0.76858	26.000	26.000	62.695	4.2918	2.5992	1.6512	0.9795	0.74193
	24.000	69.104	4.3238	2.6098	1.6568	0.8245	0.73867	28.000	28.000	66.480	4.4426	2.6484	1.6775	0.9305	0.72663
	22.000	73.521	4.5852	2.7244	1.7197	0.6870	0.70251	30.000	30.000	72.560	4.9728	2.8103	1.7695	0.7490	0.67473
	20.000	76.189	4.6852	2.7444	1.7197	0.6543	0.69468	24.000	24.000	75.420	5.1222	2.8531	1.7953	0.66068	
	18.000	78.257	4.7652	2.7488	1.7336	0.6299	0.68906	22.000	22.000						
	16.000	80.001	4.8232	2.7662	1.7436	0.6111	0.68484	20.000	20.000						
14.000	81.539	4.8669	2.7792	1.7512	0.6111	0.68162	18.000	18.000							
12.000	82.938	4.9006	2.7892	1.7570	0.5964	0.68162	16.000	16.000							
10.000	84.237	4.9264	2.7968	1.7615	0.5849	0.67914	10.000	10.000							
8.000	85.463	4.9461	2.8025	1.7649	0.5760	0.67726	8.000	8.000							
6.000	86.638	4.9606	2.8068	1.7674	0.5694	0.67588	6.000	6.000							

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
2.20	20.000	77.549	5.2175	2.8799	1.8117	0.6568	0.55185	2.30	16.000	40.816	2.4701	1.8678	1.3224	1.6676	0.92872
	18.000	79.308	5.2856	2.8987	1.8234	0.6296	0.54562		18.000	43.299	2.7360	1.9936	1.3724	1.5804	0.90351
	16.000	80.839	5.3369	2.9127	1.8323	0.6086	0.54096		20.000	46.007	3.0276	2.1230	1.4261	1.4885	0.87413
	14.000	82.216	5.3764	2.9235	1.8391	0.5921	0.53739		22.000	48.026	3.3514	2.2573	1.4847	1.3894	0.84035
	12.000	83.483	5.4073	2.9318	1.8444	0.5789	0.53462		24.000	52.536	3.7216	2.3998	1.5508	1.2788	0.80125
	10.000	84.670	5.4313	2.9382	1.8485	0.5686	0.53247		26.000	57.077	4.1819	2.5625	1.6319	1.1425	0.75319
	8.000	85.798	5.4493	2.9431	1.8517	0.5605	0.53083		27.454	64.653	4.8739	2.7813	1.7524	0.9338	0.68417
	6.000	86.883	5.4637	2.9468	1.8540	0.5545	0.52962		26.000	71.264	5.3682	2.9212	1.8377	0.7743	0.63813
	4.000	87.938	5.4727	2.9493	1.8556	0.5503	0.52879		24.000	74.512	5.5649	2.9736	1.8714	0.7060	0.62065
	2.000	88.973	5.4782	2.9507	1.8565	0.5479	0.52830		22.000	76.770	5.6817	3.0039	1.8915	0.6635	0.61049
2.25	2.000	27.926	1.1288	1.0903	1.0353	2.1725	0.99982		20.000	78.582	5.7631	3.0246	1.9054	0.6328	0.60352
	4.000	29.555	1.2703	1.1859	1.0712	2.0962	0.99861		18.000	80.133	5.8238	3.0399	1.9158	0.6092	0.59838
	6.000	31.277	1.4254	1.2864	1.1080	2.0203	0.99548		16.000	81.509	5.8705	3.0515	1.9238	0.5906	0.59445
	8.000	33.102	1.5949	1.3916	1.1461	1.9443	0.98973		14.000	82.764	5.9071	3.0606	1.9301	0.5757	0.59139
	10.000	35.034	1.7798	1.5011	1.1856	1.8674	0.98079		12.000	83.928	5.9360	3.0677	1.9350	0.5638	0.58899
	12.000	37.088	1.9812	1.6147	1.2270	1.7891	0.96827		10.000	85.026	5.9586	3.0732	1.9389	0.5543	0.58712
	14.000	39.277	2.2004	1.7319	1.2705	1.7088	0.95189		8.000	86.074	5.9761	3.0775	1.9419	0.5469	0.58568
	16.000	41.623	2.4392	1.8527	1.3166	1.6257	0.93152		6.000	87.085	5.9890	3.0807	1.9441	0.5413	0.58461
	18.000	44.161	2.7000	1.9770	1.3657	1.5388	0.90703		4.000	88.070	5.9980	3.0828	1.9456	0.5374	0.58387
	20.000	46.948	2.9871	2.1055	1.4187	1.4466	0.87829			89.039	6.0033	3.0841	1.9465	0.5352	0.58344
2.30	2.000	29.091	3.3085	2.2400	1.4770	1.3464	0.84486	2.35	2.000	26.692	1.1334	1.0935	1.0365	2.2698	0.99980
	4.000	31.837	3.6830	2.3854	1.5440	1.2318	0.80532		4.000	28.289	1.2804	1.1926	1.0736	2.1911	0.99846
	6.000	33.102	4.1839	2.5632	1.6323	1.0792	0.75298		6.000	29.979	1.4420	1.2970	1.1118	2.1129	0.99502
	8.000	35.034	4.6556	2.7153	1.7145	0.9321	0.70542		8.000	31.765	1.6189	1.4062	1.1513	2.0346	0.98872
	10.000	37.088	5.0238	2.8250	1.7783	0.8115	0.66991		10.000	33.657	1.8124	1.5199	1.1924	1.9557	0.97895
	12.000	39.277	5.2707	2.8946	1.8209	0.7254	0.64698		12.000	35.662	2.0232	1.6376	1.2354	1.8755	0.96534
	14.000	41.623	5.4009	2.9301	1.8433	0.6775	0.63519		14.000	37.790	2.2526	1.7589	1.2807	1.7934	0.94765
	16.000	44.161	5.4884	2.9534	1.8583	0.6441	0.62739		16.000	40.060	2.5021	1.8833	1.3285	1.7089	0.92580
	18.000	46.948	5.5523	2.9703	1.8693	0.6189	0.62175		18.000	42.497	2.7736	2.0108	1.3794	1.6212	0.89981
	20.000	49.744	5.6011	2.9830	1.8776	0.5993	0.61749		20.000	45.140	3.0705	2.1413	1.4339	1.5291	0.86971
2.30	2.000	27.294	1.1311	1.0919	1.0359	2.2212	0.99981		22.000	48.059	3.3981	2.2759	1.4931	1.4308	0.83542
	4.000	28.906	1.2753	1.1892	1.0724	2.1437	0.99854		24.000	51.393	3.7677	2.4168	1.5590	1.3227	0.79639
	6.000	30.611	1.4336	1.2916	1.1099	2.0667	0.99526		26.000	55.500	4.2092	2.5717	1.6367	1.1954	0.75038
	8.000	32.415	1.6068	1.3988	1.1487	1.9896	0.98923		28.000	62.973	4.9459	2.8024	1.7648	0.9810	0.67729
	10.000	34.326	1.7959	1.5104	1.1890	1.9117	0.98006		28.082	64.679	5.0977	2.8462	1.7911	0.9354	0.66296
	12.000	36.354	2.0019	1.6260	1.2311	1.8325	0.96614		28.000	66.328	5.2377	2.8855	1.8152	0.8927	0.65000
	14.000	38.510	2.2261	1.7452	1.2755	1.7514	0.95068		26.000	72.454	5.6907	3.0062	1.8930	0.7474	0.60972
									24.000	75.251	5.8587	3.0486	1.9218	0.6895	0.59544
									22.000	77.317	5.9657	3.0750	1.9401	0.6510	0.58653
									20.000	80.483	6.0423	3.0936	1.9532	0.58024	0.5826

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$
2.35	6.000	87.174	6.2606	3.1453	1.9904	0.5353	0.56272	2.45	26.000	53.045	4.3053	2.6037	1.6535	1.2861	0.74055
	4.000	88.129	6.2694	3.1474	1.9919	0.5315	0.56203		28.000	57.780	4.8455	2.7729	1.7475	1.1385	0.68691
	2.000	89.068	6.2745	3.1486	1.9928	0.5293	0.56162		29.253	64.744	5.5614	2.9727	1.8708	0.9386	0.62095
2.40	2.000	26.120	1.1358	1.0951	1.0371	2.3184	0.99979		26.000	74.185	6.3161	3.1029	1.9598	0.7827	0.57709
	4.000	27.702	1.2856	1.1960	1.0749	2.2383	0.99839		24.000	76.446	6.4516	3.1891	2.0230	0.6623	0.54787
	6.000	29.377	1.4505	1.3023	1.1138	2.1589	0.99478		22.000	78.236	6.5451	3.2101	2.0389	0.6294	0.54076
	8.000	31.149	1.6314	1.4137	1.1540	2.0794	0.98818		20.000	79.752	6.6146	3.2254	2.0509	0.6042	0.53557
	10.000	33.023	1.8292	1.5295	1.1959	1.9994	0.97797		18.000	81.089	6.6682	3.2372	2.0599	0.5842	0.53155
	12.000	35.007	2.0450	1.6495	1.2398	1.9181	0.96377		16.000	82.299	6.7105	3.2464	2.0671	0.5681	0.52845
	14.000	37.112	2.2798	1.7729	1.2860	1.8350	0.94538		14.000	83.416	6.7442	3.2536	2.0728	0.5550	0.52599
	16.000	39.351	2.5351	1.8993	1.3348	1.7497	0.92274		12.000	84.462	6.7710	3.2594	2.0774	0.5444	0.52403
	18.000	41.748	2.8128	2.0285	1.3866	1.6613	0.89592		10.000	85.455	6.7923	3.2640	2.0810	0.5359	0.52249
	20.000	44.336	3.1155	2.1604	1.4421	1.5689	0.86505		8.000	86.408	6.8088	3.2675	2.0838	0.5292	0.52129
	22.000	47.174	3.4480	2.2955	1.5021	1.4709	0.83015		6.000	87.331	6.8211	3.2701	2.0859	0.5242	0.52041
	24.000	50.371	3.8196	2.4357	1.5682	1.3644	0.79093		4.000	88.232	6.8296	3.2719	2.0873	0.5207	0.51979
26.000	54.184	4.2521	2.5861	1.6442	1.2426	0.74598		2.000	89.119	6.8346	3.2730	2.0882	0.5186	0.51943	
28.000	59.656	4.8382	2.7707	1.7462	1.0779	0.68761		2.50	2.000	25.050	1.1405	1.0984	1.0384	2.4155	0.99977
28.681	64.710	5.3269	2.9100	1.8305	0.9370	0.64187			4.000	26.609	1.2961	1.2029	1.0775	2.3326	0.99822
28.000	69.291	5.7130	3.0119	1.8968	0.8201	0.60781			6.000	28.259	1.4679	1.3133	1.1177	2.2505	0.99427
26.000	73.400	6.0048	3.0845	1.9468	0.7260	0.58331			8.000	30.005	1.6568	1.4289	1.1595	2.1685	0.98703
24.000	75.889	6.1539	3.1203	1.9722	0.6751	0.57121			10.000	31.851	1.8639	1.5493	1.2031	2.0859	0.97589
22.000	77.803	6.2534	3.1436	1.9892	0.6397	0.56329			12.000	33.802	2.0900	1.6737	1.2488	2.0022	0.96046
20.000	79.402	6.3260	3.1605	2.0016	0.6129	0.55758			14.000	35.866	2.3364	1.8015	1.2969	1.9169	0.94057
18.000	80.800	6.3816	3.1732	2.0111	0.5919	0.55326			16.000	38.057	2.6042	2.0042	1.3478	1.8295	0.91625
16.000	82.059	6.4251	3.1831	2.0185	0.5751	0.54990			18.000	40.389	2.8949	2.2062	1.4018	1.7394	0.88767
14.000	83.217	6.4596	3.1909	2.0244	0.5615	0.54726			20.000	42.890	3.2109	2.4775	1.4594	1.6458	0.85510
12.000	84.299	6.4870	3.1971	2.0290	0.5505	0.54517			22.000	45.602	3.5558	2.8373	1.5213	1.5475	0.81877
10.000	85.324	6.5087	3.2019	2.0327	0.5416	0.54352			24.000	48.600	3.9361	3.2474	1.5887	1.4426	0.77871
8.000	86.306	6.5254	3.2057	2.0356	0.5348	0.54225		26.000	52.036	4.3657	3.6984	1.6641	1.3268	0.73441	
6.000	87.255	6.5379	3.2085	2.0377	0.5296	0.54131		28.000	56.335	4.8844	4.2844	1.7542	1.1888	0.68317	
4.000	88.182	6.5466	3.2104	2.0392	0.5260	0.54065		29.797	64.782	5.8014	5.0342	1.9120	0.9402	0.60027	
2.000	89.094	6.5517	3.2115	2.0400	0.5238	0.54027		28.000	71.949	6.4249	6.2282	2.0185	0.7573	0.54992	
2.45	2.000	25.572	1.1381	1.0968	1.0377	2.3670	0.99978		26.000	74.856	6.6273	3.2282	2.0529	0.6928	0.53460
	4.000	27.143	1.2908	1.1994	1.0762	2.2855	0.99831		24.000	76.939	6.7526	3.2555	2.0742	0.6509	0.52525
	6.000	28.805	1.4591	1.3078	1.1157	2.2048	0.99453		22.000	78.625	6.8414	3.2744	2.0893	0.6201	0.51894
	8.000	30.563	1.6440	1.4212	1.1567	2.1241	0.98761		20.000	80.070	6.9082	3.2885	2.1007	0.5962	0.51417
	10.000	32.422	1.8463	1.5393	1.1994	2.0428	0.97695		18.000	81.353	6.9602	3.2994	2.1095	0.5770	0.51048
	12.000	34.388	2.0672	1.6615	1.2442	1.9603	0.96215		16.000	82.518	7.0014	3.3080	2.1165	0.5616	0.50759
	14.000	36.472	2.3078	1.7871	1.2914	1.8762	0.94302		14.000	84.612	7.0607	3.3148	2.1221	0.5489	0.50528
	16.000	38.685	2.5692	1.9156	1.3412	1.7898	0.92615		12.000	86.576	7.0979	3.3245	2.1266	0.5387	0.50345
	18.000	41.047	2.8532	2.0466	1.3941	1.7006	0.91955		10.000	88.502	7.0816	3.3278	2.1301	0.5304	0.50200
	20.000	43.588	3.1623	2.1800	1.4506	1.6077	0.86018		8.000	89.400	7.1100	3.3303	2.1350	0.5191	0.50005
	22.000	46.358	3.5007	2.3160	1.5115	1.5097	0.82459		4.000	88.277	7.1184	3.3320	2.1364	0.5157	0.49947
	24.000	49.445	3.8759	2.4560	1.5781	1.4042	0.78502		2.000	89.142	7.1234	3.3330	2.1372	0.5137	0.49913

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	
2.55	2.000	24.550	1.1429	1.1001	1.0390	2.4639	0.99976	2.60	30.814	64.866	6.2972	3.1538	1.9967	0.9433	0.55984	
	4.000	26.099	1.3015	1.2065	1.0788	2.3796	0.99814	30.000	30.000	69.778	6.7777	3.2609	2.0785	0.8111	0.52354	
	6.000	27.739	1.4768	1.3189	1.1198	2.2961	0.99399	28.000	28.000	73.590	7.0906	3.3263	2.1317	0.7189	0.50138	
	8.000	29.474	1.6699	1.4367	1.1623	2.2128	0.98642	26.000	26.000	75.955	7.2555	3.3596	2.1596	0.6673	0.49015	
	10.000	31.307	1.8817	1.5593	1.2067	2.1288	0.97479	24.000	24.000	77.778	7.3665	3.3815	2.1785	0.6311	0.48276	
	12.000	33.244	2.1133	1.6861	1.2534	2.0438	0.95871	22.000	22.000	79.299	7.4481	3.3974	2.1923	0.6035	0.47742	
	14.000	35.293	2.3656	1.8162	1.3025	1.9573	0.93803	20.000	20.000	80.626	7.5108	3.4095	2.2029	0.5817	0.47336	
	16.000	37.463	2.6399	1.9490	1.3545	1.8687	0.91283	18.000	18.000	81.815	7.5602	3.4189	2.2113	0.5641	0.47020	
	18.000	39.770	2.9378	2.0840	1.4097	1.7776	0.88333	16.000	16.000	82.906	7.5997	3.4264	2.2180	0.5497	0.46768	
	20.000	42.236	3.2611	2.2207	1.4685	1.6832	0.84985	14.000	14.000	83.922	7.6316	3.4324	2.2234	0.5378	0.46566	
	22.000	44.899	3.6130	2.3591	1.5315	1.5845	0.81272	12.000	12.000	84.879	7.6572	3.4372	2.2277	0.5282	0.46405	
	24.000	47.822	3.9995	2.4998	1.5999	1.4797	0.77209	10.000	10.000	85.792	7.6775	3.4411	2.2312	0.5204	0.46277	
	26.000	51.130	4.4319	2.6449	1.6756	1.3655	0.72772	8.000	8.000	86.671	7.6934	3.4440	2.2338	0.5143	0.46178	
	28.000	55.131	4.9401	2.8007	1.7638	1.2334	0.67784	6.000	6.000	87.524	7.7053	3.4462	2.2359	0.5096	0.46104	
	30.000	61.449	5.6866	3.0051	1.8923	1.0385	0.61007	4.000	4.000	88.359	7.7135	3.4478	2.2372	0.5064	0.46053	
	30.317	64.823	6.0466	3.0946	1.9539	0.9418	0.57989	2.000	2.000	89.183	7.7184	3.4487	2.2381	0.5045	0.46022	
	30.000	67.966	6.3519	3.1664	2.0060	0.8568	0.55557									
	28.000	72.844	6.7595	3.2569	2.0754	0.7364	0.52487									
	26.000	75.440	6.9402	3.2952	2.1061	0.6793	0.51190									
	24.000	77.380	7.0575	3.3195	2.1260	0.6405	0.50368	2.65	2.000	23.613	1.1479	1.1034	1.0403	1.0403	2.5607	0.99973
	22.000	78.978	7.1423	3.3368	2.1404	0.6115	0.49783	4.000	4.000	25.144	1.3124	1.2136	1.0814	1.0814	2.4734	0.99796
	20.000	80.360	7.2068	3.3499	2.1514	0.5887	0.49343	6.000	6.000	26.766	1.4950	1.3302	1.1239	1.1239	2.3869	0.99341
	18.000	81.594	7.2575	3.3600	2.1600	0.5703	0.49002	8.000	8.000	28.482	1.6966	1.4525	1.1680	1.1680	2.3007	0.98514
	16.000	82.720	7.2978	3.3680	2.1668	0.5554	0.48732	10.000	10.000	30.295	1.9182	1.5798	1.2142	1.2142	2.2139	0.97247
	14.000	83.766	7.3301	3.3744	2.1723	0.5432	0.48517	12.000	12.000	32.210	2.1610	1.7113	1.2628	1.2628	2.1262	0.95502
	12.000	84.750	7.3561	3.3795	2.1767	0.5333	0.48345	14.000	14.000	34.232	2.4260	1.8462	1.3141	1.3141	2.0370	0.93270
	10.000	85.688	7.3767	3.3835	2.1802	0.5253	0.48209	16.000	16.000	36.368	2.7141	1.9835	1.3683	1.3683	1.9459	0.90566
	8.000	86.590	7.3927	3.3866	2.1829	0.5190	0.48104	18.000	18.000	38.632	3.0267	2.1226	1.4259	1.4259	1.8524	0.87423
	6.000	87.464	7.4047	3.3890	2.1849	0.5142	0.48025	20.000	20.000	41.043	3.3657	2.2630	1.4873	1.4873	1.7560	0.83884
	4.000	88.320	7.4131	3.3906	2.1864	0.5109	0.47971	22.000	22.000	43.627	3.7335	2.4042	1.5529	1.5529	1.6559	0.80000
2.000	89.163	7.4180	3.3916	2.1872	0.5090	0.47939	24.000	24.000	46.433	4.1347	2.5465	1.6237	1.6237	1.5507	0.75806	
2.60	2.000	24.071	1.1454	1.1017	1.0396	2.5123	0.99975	26.000	26.000	49.549	4.5776	2.6911	1.7010	1.4380	0.71313	
	4.000	25.611	1.3070	1.2100	1.0801	2.4265	0.99975	28.000	28.000	53.164	5.0815	2.8416	1.7883	1.3126	0.66448	
	6.000	27.241	1.4858	1.3245	1.1218	2.3416	0.99805	30.000	30.000	57.877	5.7097	3.0110	1.8963	1.1576	0.60809	
	8.000	28.966	1.6831	1.4445	1.1651	2.2568	0.99371	31.288	31.288	64.910	6.5531	3.2118	2.0403	0.9447	0.54016	
	10.000	30.789	1.8998	1.5695	1.2105	2.1715	0.98579	30.000	30.000	70.983	7.1564	3.3397	2.1428	0.7814	0.49687	
	12.000	32.714	2.1369	1.6986	1.2580	2.0852	0.97365	28.000	28.000	74.230	7.4211	3.3922	2.1877	0.7039	0.47918	
	14.000	34.749	2.3955	1.8311	1.3082	1.9973	0.95690	26.000	26.000	76.415	7.5742	3.4216	2.2137	0.6565	0.46930	
	16.000	36.901	2.6767	1.9662	1.3613	1.9075	0.93541	24.000	24.000	78.138	7.6801	3.4415	2.2316	0.6224	0.46262	
	18.000	39.185	2.9817	2.1032	1.4177	1.8152	0.87884	22.000	22.000	79.592	7.7589	3.4562	2.2449	0.5962	0.45771	
	20.000	41.621	3.3126	2.2417	1.4778	1.7199	0.80930	20.000	20.000	80.870	7.8200	3.4674	2.2553	0.5752	0.45396	
	22.000	44.242	3.6723	2.3814	1.5421	1.6205	0.74443	18.000	18.000	82.020	7.8684	3.4763	2.2634	0.5582	0.45101	
	24.000	47.102	4.0658	2.5229	1.6116	1.5157	0.68520	16.000	16.000	83.079	7.9073	3.4833	2.2700	0.5442	0.44866	
	26.000	50.305	4.5028	2.6675	1.6880	1.4025	0.62660	14.000	14.000	84.066	7.9387	3.4890	2.2753	0.5327	0.44677	
	28.000	54.088	5.0067	2.8201	1.7754	1.2744	0.56715	12.000	12.000	84.998	7.9640	3.4935	2.2796	0.5234	0.44526	
	30.000	59.352	5.6706	3.0010	1.8896	1.1062	0.50815	10.000	10.000	85.888	7.9841	3.4972	2.2830	0.5158	0.44406	
									6.000	86.746	7.9999	3.5000	2.2857	0.5098	0.44312	
									2.000	87.579	8.0116	3.5021	2.2877	0.5053	0.44242	

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
2.65	4.000	88.396	8.0198	3.5035	2.2891	0.5021	0.44194	2.75	24.000	45.225	4.2794	2.5951	1.6490	1.6181	0.74319
	2.000	89.200	8.0247	3.5044	2.2899	0.5003	0.44165		26.000	48.206	4.7375	2.7404	1.7288	1.5056	0.69739
2.70	2.000	23.173	1.1503	1.1051	1.0409	2.6090	0.99972	30.000	55.674	5.8507	3.0466	1.9204	1.2416	0.59611	
	4.000	24.696	1.3179	1.2172	1.0827	2.5201	0.99786	32.000	62.549	6.7812	3.2616	2.0791	1.0209	0.52329	
	6.000	26.311	1.5042	1.3360	1.1260	2.4321	0.99311	32.000	65.002	7.0807	3.3243	2.1300	0.9476	0.50207	
	8.000	28.019	1.7102	1.4605	1.1709	2.3444	0.98446	30.000	72.678	7.8741	3.4773	2.1748	0.8812	0.48420	
	10.000	29.824	1.9369	1.5902	1.2180	2.2561	0.97125	28.000	75.285	8.0670	3.5154	2.3004	0.6789	0.43799	
	12.000	31.728	2.1855	1.7241	1.2676	2.1669	0.95309	26.000	77.202	8.2233	3.5393	2.3235	0.6378	0.43010	
	14.000	33.739	2.4569	1.8614	1.3199	2.0763	0.92991	24.000	78.766	8.3214	3.5561	2.3400	0.6071	0.42454	
	16.000	35.862	2.7523	2.0010	1.3754	1.9838	0.90191	22.000	80.110	8.3960	3.5688	2.3526	0.5829	0.42037	
	18.000	38.109	3.0727	2.1423	1.4343	1.8890	0.86948	20.000	81.303	8.4545	3.5786	2.3625	0.5634	0.41714	
	20.000	40.496	3.4200	2.2845	1.4970	1.7915	0.83311	18.000	82.386	8.5014	3.5864	2.3704	0.5474	0.41457	
	22.000	43.049	3.7964	2.4273	1.5641	1.6905	0.79337	16.000	83.387	8.5392	3.5927	2.3768	0.5343	0.41251	
	24.000	45.809	4.2059	2.5706	1.6362	1.5848	0.75072	14.000	84.324	8.5699	3.5978	2.3820	0.5234	0.41085	
	26.000	48.852	4.6560	2.7155	1.7146	1.4723	0.70538	12.000	85.212	8.5948	3.6019	2.3862	0.5145	0.40951	
	28.000	52.334	5.1626	2.8645	1.8022	1.3488	0.65692	10.000	86.062	8.6146	3.6051	2.3895	0.5072	0.40845	
	30.000	56.687	5.7730	3.0271	1.9071	1.2018	0.60268	8.000	86.882	8.6301	3.6077	2.3922	0.5015	0.40762	
	31.741	64.956	6.8143	3.2687	2.0847	0.9462	0.52090	6.000	87.680	8.6418	3.6096	2.3941	0.4972	0.40700	
	30.000	71.913	7.5186	3.4110	2.2042	0.7587	0.45808	4.000	88.462	8.6499	3.6109	2.3955	0.4942	0.40656	
	28.000	74.790	7.7529	3.4551	2.2439	0.6907	0.44930	2.000	89.234	8.6547	3.6117	2.3963	0.4924	0.40631	
26.000	76.828	7.8967	3.4814	2.2682	0.6468	0.44321									
24.000	78.466	7.9983	3.4997	2.2854	0.6145	0.43870	2.80	22.344	22.344	1.1553	1.1085	1.0422	2.7056	0.99969	
22.000	79.862	8.0748	3.5133	2.2984	0.5893	0.43522	4.000	23.854	23.854	1.3292	1.2246	1.0854	2.6133	0.99766	
20.000	81.095	8.1345	3.5238	2.3085	0.5691	0.43247	6.000	25.455	25.455	1.5230	1.3476	1.1302	2.5222	0.99246	
18.000	82.210	8.1821	3.5321	2.3165	0.5527	0.43027	8.000	27.150	27.150	1.7379	1.4768	1.1768	2.4313	0.98304	
16.000	83.238	8.2204	3.5388	2.3230	0.5391	0.42850	10.000	28.940	28.940	1.9751	1.6113	1.2257	2.3399	0.96869	
14.000	84.199	8.2515	3.5441	2.3282	0.5279	0.42708	12.000	30.830	30.830	2.2357	1.7502	1.2774	2.2476	0.94903	
12.000	85.109	8.2765	3.5484	2.3324	0.5188	0.42595	14.000	32.822	32.822	2.5205	1.8923	1.3320	2.1540	0.92409	
10.000	85.978	8.2965	3.5518	2.3358	0.5114	0.42506	16.000	34.923	34.923	2.8309	2.0367	1.3900	2.0585	0.89411	
8.000	86.816	8.3121	3.5545	2.3385	0.5056	0.42441	18.000	37.141	37.141	3.1677	2.1822	1.4516	1.9610	0.85962	
6.000	87.631	8.3238	3.5565	2.3404	0.5012	0.42411	20.000	39.490	39.490	3.5324	2.3283	1.5172	1.8610	0.82123	
4.000	88.430	8.3319	3.5579	2.3418	0.4981	0.42395	22.000	41.990	41.990	3.9271	2.4743	1.5872	1.7578	0.77965	
2.000	89.218	8.3367	3.5587	2.3426	0.4962	0.42368	24.000	44.676	44.676	4.3550	2.6200	1.6622	1.6506	0.73549	
							26.000	47.604	47.604	4.8219	2.7658	1.7434	1.5379	0.68919	
2.75	2.000	22.750	1.1528	1.1068	1.0415	2.6573	0.99971	28.000	50.887	5.3398	2.9135	1.8328	1.4163	0.64070	
	4.000	24.267	1.3236	1.2209	1.0841	2.5667	0.99776	30.000	54.786	5.9387	3.0683	1.9355	1.2783	0.58877	
	6.000	25.873	1.5135	1.3417	1.1280	2.4772	0.99279	32.000	60.433	6.7529	3.2555	2.0743	1.0909	0.52535	
	8.000	27.575	1.7239	1.4686	1.1738	2.3879	0.98377	32.587	65.050	7.3524	3.3788	2.1761	0.9490	0.48369	
	10.000	29.372	1.9558	1.6007	1.2219	2.2982	0.96999	32.000	69.211	7.8278	3.4689	2.2566	0.8307	0.45348	
	12.000	31.269	2.2104	1.7371	1.2724	2.2074	0.95109	30.000	73.328	8.2272	3.5399	2.3241	0.7243	0.42988	
	14.000	33.269	2.4885	1.8768	1.3259	2.1153	0.92704	28.000	75.728	8.4241	3.5999	2.3574	0.6684	0.41882	
	16.000	35.381	2.7912	2.0188	1.3826	2.0213	0.89806	26.000	77.543	8.5544	3.5952	2.3794	0.6296	0.41169	
	18.000	37.612	3.1197	2.1622	1.4429	1.9253	0.86461	24.000	79.042	8.6495	3.6108	2.3954	0.6002	0.40659	
	20.000	39.980	3.4757	2.3063	1.5070	1.8265	0.82724	22.000	80.339	8.7224	3.6227	2.4077	0.5769	0.40273	
	22.000	42.504	3.8610	2.4506	1.5755	1.7245	0.78659	20.000	81.496	8.7800	3.6319	2.4174	0.5580	0.39971	



### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
2.80	18.000	82.550	8.8262	3.6393	2.4252	0.5425	0.39731	2.90	6.000	24.666	1.5421	1.3594	1.1344	2.6117	0.99178
	16.000	83.525	8.8637	3.6453	2.4316	0.5297	0.39538		8.000	26.350	1.7663	1.4933	1.1828	2.5175	0.98153
	14.000	84.440	8.8942	3.6501	2.4367	0.5191	0.39382		10.000	28.129	2.0143	1.6328	1.2336	2.4229	0.96597
	12.000	85.308	8.9188	3.6540	2.4409	0.5103	0.39256		12.000	30.007	2.2873	1.7767	1.2874	2.3273	0.94475
	10.000	86.140	8.9385	3.6571	2.4442	0.5033	0.39156		14.000	31.985	2.5863	1.9238	1.3444	2.2304	0.91794
	8.000	86.943	8.9540	3.6595	2.4468	0.4977	0.39078		16.000	34.069	2.9123	2.0729	1.4050	2.1318	0.88591
	6.000	87.725	8.9656	3.6613	2.4487	0.4935	0.39019		18.000	36.264	3.2663	2.2229	1.4694	2.0313	0.84930
	4.000	88.492	8.9737	3.6626	2.4501	0.4905	0.38978		20.000	38.584	3.6496	2.3729	1.5380	1.9285	0.80886
	2.000	89.248	8.9784	3.6633	2.4509	0.4887	0.38954		22.000	41.044	4.0638	2.5222	1.6112	1.8229	0.76540
									24.000	43.672	4.5119	2.6704	1.6896	1.7138	0.71969
2.85	2.000	21.954	1.1579	1.1103	1.0429	2.7537	0.99968		26.000	46.515	4.9984	2.8177	1.7739	1.5999	0.67230
	4.000	23.457	1.3349	1.2283	1.0868	2.6598	0.99755		28.000	49.655	5.5328	2.9652	1.8659	1.4788	0.62347
	6.000	25.052	1.5325	1.3535	1.1323	2.5670	0.99213		30.000	53.274	6.1364	3.1161	1.9692	1.3453	0.57262
	8.000	26.742	1.7520	1.4850	1.1798	2.4744	0.98230		32.000	57.931	6.8791	3.2824	2.0957	1.1827	0.51624
	10.000	28.526	1.9946	1.6220	1.2297	2.3815	0.96735		33.363	65.145	7.9116	3.4841	2.2708	0.9516	0.44840
	12.000	30.410	2.2613	1.7634	1.2824	2.2876	0.94692		30.000	74.392	8.9347	3.6565	2.4435	0.6985	0.39175
	14.000	32.394	2.5532	1.9080	1.3382	2.1923	0.92105		28.000	76.490	9.1095	3.6836	2.4730	0.6500	0.38301
	16.000	34.486	2.8712	2.0547	1.3974	2.0953	0.89006		26.000	78.142	9.2307	3.7020	2.4934	0.6149	0.37709
	18.000	36.692	3.2165	2.2025	1.4604	1.9964	0.85451		24.000	79.533	9.3212	3.7156	2.5087	0.5878	0.37275
	20.000	39.025	3.5904	2.3505	1.5275	1.8950	0.81511		22.000	80.750	9.3915	3.7260	2.5205	0.5660	0.36942
2.90	2.000	41.505	3.9948	2.4982	1.5991	1.7906	0.77258		20.000	81.843	9.4475	3.7343	2.5300	0.5482	0.36680
	4.000	44.160	4.4325	2.6451	1.6757	1.6825	0.72766		18.000	82.845	9.4928	3.7409	2.5376	0.5335	0.36469
	6.000	47.042	4.9089	2.7916	1.7585	1.5692	0.68081		16.000	83.775	9.5296	3.7462	2.5438	0.5212	0.36299
	8.000	50.247	5.4345	2.9391	1.8490	1.4481	0.63219		14.000	84.651	9.5597	3.7506	2.5489	0.5111	0.36161
	10.000	53.992	6.0344	3.0917	1.9518	1.3127	0.58089		12.000	85.484	9.5842	3.7541	2.5530	0.5027	0.36049
	12.000	59.037	6.8013	3.2659	2.0825	1.1407	0.52183		10.000	86.283	9.6038	3.7570	2.5563	0.4959	0.35960
	14.000	65.097	7.6294	3.4320	2.2230	0.9503	0.46580		8.000	87.055	9.6191	3.7592	2.5588	0.4906	0.35890
	16.000	70.389	8.2421	3.5425	2.3266	0.8001	0.42903		6.000	87.808	9.6306	3.7608	2.5608	0.4865	0.35838
	18.000	73.893	8.5802	3.5995	2.3837	0.7107	0.41030		4.000	88.546	9.6387	3.7620	2.5621	0.4836	0.35802
	20.000	76.127	8.7648	3.6295	2.4149	0.6588	0.40050		2.000	89.275	9.6434	3.7626	2.5629	0.4819	0.35780
2.95	2.000	77.855	8.8902	3.6495	2.4360	0.6220	0.39402								
	4.000	79.297	8.9827	3.6640	2.4516	0.5938	0.38933								
	6.000	80.552	9.0543	3.6751	2.4637	0.5713	0.38574	2.95	2.000	21.216	1.1630	1.1138	1.0442	2.8500	0.99965
	8.000	81.676	9.1110	3.6838	2.4733	0.5530	0.38294		4.000	22.708	1.3464	1.2357	1.0895	2.7526	0.99732
	10.000	82.702	9.1567	3.6908	2.4810	0.5379	0.38069		6.000	24.294	1.5518	1.3654	1.1366	2.6563	0.99142
	12.000	83.655	9.1938	3.6964	2.4872	0.5253	0.37888		8.000	25.974	1.7807	1.5017	1.1858	2.5604	0.98074
	14.000	84.549	9.2241	3.7010	2.4923	0.5150	0.37741		10.000	27.749	2.0343	1.6437	1.2377	2.4640	0.96454
	16.000	85.399	9.2486	3.7047	2.4964	0.5064	0.37623		12.000	29.621	2.3137	1.7901	1.2925	2.3668	0.94252
	18.000	86.213	9.2683	3.7077	2.4998	0.4995	0.37528		14.000	31.593	2.6199	1.9396	1.3507	2.2682	0.91475
	20.000	87.001	9.2836	3.7100	2.5023	0.4940	0.37454		16.000	33.670	2.9540	2.0911	1.4126	2.1679	0.88168
2.90	2.000	87.768	9.2952	3.7117	2.5043	0.4899	0.37399		18.000	35.856	3.3169	2.2434	1.4785	2.0658	0.84398
	4.000	88.520	9.3033	3.7129	2.5057	0.4870	0.37360		20.000	38.164	3.7098	2.3954	1.5487	1.9615	0.80249
	6.000	89.262	9.3080	3.7136	2.5065	0.4853	0.37338		22.000	40.607	4.1344	2.5464	1.6236	1.8546	0.75809
	8.000								24.000	43.211	4.5930	2.6959	1.7037	1.7444	0.71160
	10.000								26.000	46.018	5.0902	2.8441	1.7898	1.6297	0.66366
	12.000								28.000	49.102	5.6343	2.9916	1.8833	1.5085	0.61460
	14.000								30.000	52.618	6.2438	3.1414	1.9876	1.3762	0.56404
	16.000														
	18.000														
	20.000														

# Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$
2.95	32.000	56.997	6.9741	3.3023	2.1119	1.2199	0.50950	3.00	14.000	84.837	10.2483	3.8459	2.6647	0.5038	0.33180
	33.726	65.193	8.1990	3.5350	2.3194	0.9528	0.43150		12.000	85.638	10.2726	3.8491	2.6688	0.4958	0.33081
	32.000	72.020	9.0188	3.6696	2.4577	0.7585	0.38752		10.000	86.408	10.2921	3.8517	2.6721	0.4892	0.33001
	30.000	74.838	9.2917	3.7112	2.5037	0.6877	0.37416		8.000	87.154	10.3074	3.8537	2.6747	0.4841	0.32939
	28.000	76.821	9.4585	3.7359	2.5318	0.6420	0.36628		6.000	87.881	10.3190	3.8553	2.6766	0.4801	0.32892
	26.000	78.407	9.5762	3.7530	2.5516	0.6084	0.36086		4.000	88.594	10.3270	3.8563	2.6779	0.4774	0.32860
	24.000	79.752	9.6649	3.7657	2.5666	0.5821	0.35684		2.000	89.299	10.3318	3.8569	2.6787	0.4757	0.32841
	22.000	80.985	9.7342	3.7755	2.5782	0.5610	0.35374								
	20.000	82.000	9.7896	3.7834	2.5875	0.5437	0.35128								
	18.000	82.978	9.8345	3.7896	2.5951	0.5293	0.34931	3.05	2.000	20.530	1.1681	1.1173	1.0455	2.9462	0.99962
	16.000	83.889	9.8712	3.7947	2.6013	0.5173	0.34771		4.000	22.014	1.3581	1.2433	1.0923	2.8450	0.99708
	14.000	84.747	9.9012	3.7989	2.6063	0.5074	0.34641		6.000	23.591	1.5716	1.3774	1.1409	2.7451	0.99066
	12.000	85.563	9.9255	3.8023	2.6104	0.4992	0.34536		8.000	25.263	1.8100	1.5186	1.1919	2.6457	0.97909
	10.000	86.348	9.9450	3.8050	2.6137	0.4925	0.34452		10.000	27.031	2.0749	1.6656	1.2458	2.5458	0.96158
	8.000	87.106	9.9604	3.8071	2.6163	0.4872	0.34386		12.000	28.895	2.3674	1.8171	1.3029	2.4450	0.93788
	6.000	87.845	9.9719	3.8087	2.6182	0.4832	0.34336		14.000	30.859	2.6886	1.9717	1.3636	2.3429	0.90814
	4.000	88.571	9.9799	3.8098	2.6196	0.4804	0.34302		16.000	32.923	3.0394	2.1281	1.4282	2.2392	0.87292
	2.000	89.288	9.9847	3.8104	2.6204	0.4788	0.34282		18.000	35.095	3.4208	2.2848	1.4972	2.1338	0.83303
									20.000	37.382	3.8338	2.4408	1.5707	2.0263	0.78944
									22.000	39.797	4.2796	2.5952	1.6490	1.9166	0.74317
3.00	2.000	20.867	1.1656	1.1155	1.0449	2.8981	0.99963		24.000	42.361	4.7607	2.7474	1.7328	1.8039	0.69513
	4.000	22.355	1.3522	1.2395	1.0909	2.7988	0.99721		26.000	45.110	5.2806	2.8973	1.8226	1.6874	0.64608
	6.000	23.936	1.5616	1.3714	1.1387	2.7008	0.99105		28.000	48.102	5.8462	3.0455	1.9196	1.5654	0.59649
	8.000	25.611	1.7953	1.5101	1.1888	2.6031	0.97993		30.000	51.455	6.4722	3.1938	2.0265	1.4345	0.54630
	10.000	27.383	2.0545	1.6546	1.2417	2.5050	0.96308		32.000	55.456	7.1967	3.3478	2.1497	1.2858	0.49412
	12.000	29.251	2.3404	1.8036	1.2977	2.4060	0.94022		34.000	61.505	8.2161	3.5380	2.3222	1.0765	0.43052
	14.000	31.218	2.6540	1.9556	1.3571	2.3056	0.91148		34.407	65.288	8.7895	3.6335	2.4190	0.9552	0.39922
	16.000	33.288	2.9964	2.1095	1.4204	2.2037	0.87734		34.000	68.742	9.2596	3.7064	2.4983	0.8514	0.37570
	18.000	35.467	3.3685	2.2641	1.4878	2.1000	0.83855		32.000	73.184	9.7779	3.7817	2.5856	0.7291	0.35180
	20.000	37.764	3.7713	2.4181	1.5596	1.9941	0.79602		30.000	75.604	10.0154	3.8146	2.6255	0.6689	0.34151
	22.000	40.192	4.2064	2.5708	1.6362	1.8858	0.75068		28.000	77.406	10.1703	3.8355	2.6516	0.6276	0.33501
	24.000	42.775	4.6761	2.7216	1.7181	1.7744	0.70340		26.000	78.880	10.2825	3.8505	2.6705	0.5965	0.33040
	26.000	45.552	5.1844	2.8706	1.8060	1.6589	0.65491		24.000	80.145	10.3683	3.8617	2.6849	0.5719	0.32694
	28.000	48.586	5.7388	3.0184	1.9012	1.5374	0.60560		22.000	81.267	10.4361	3.8705	2.6963	0.5518	0.32423
	30.000	52.014	6.3559	3.1673	2.0067	1.4059	0.55526		20.000	82.284	10.4906	3.8776	2.7055	0.5353	0.32208
	32.000	56.182	7.0810	3.3244	2.1300	1.2541	0.50205		18.000	83.221	10.5350	3.8833	2.7129	0.5215	0.32034
	34.000	63.673	8.2682	3.5470	2.3310	1.0029	0.42755		16.000	84.095	10.5714	3.8879	2.7190	0.5100	0.31892
	34.073	65.241	8.4917	3.5848	2.3688	0.9540	0.41510		14.000	84.921	10.6012	3.8917	2.7240	0.5005	0.31777
	34.000	66.749	8.6971	3.6186	2.4035	0.9083	0.40406		12.000	85.709	10.6255	3.8948	2.7281	0.4926	0.31683
	32.000	72.642	9.3988	3.7271	2.5217	0.7428	0.36908		10.000	86.466	10.6450	3.8973	2.7314	0.4861	0.31608
	30.000	75.239	9.6517	3.7638	2.5643	0.6779	0.35743		8.000	87.199	10.6603	3.8992	2.7340	0.4810	0.31549
	28.000	77.126	9.8121	3.7865	2.5913	0.6345	0.35029		6.000	87.914	10.6719	3.9007	2.7359	0.4772	0.31505
	26.000	78.652	9.9268	3.8024	2.6106	0.6022	0.34530		4.000	88.617	10.6799	3.9017	2.7373	0.4744	0.31474
	24.000	79.956	10.0139	3.8144	2.6253	0.5768	0.34157		2.000	89.310	10.6847	3.9023	2.7381	0.4728	0.31456
	22.000	81.106	10.0824	3.8237	2.6368	0.5563	0.33868								
	20.000	82.147	10.1373	3.8311	2.6460	0.5394	0.33638								
	18.000	83.103	10.1819	3.8371	2.6536	0.5253	0.33453	3.10	2.000	20.205	1.1707	1.1190	1.0462	2.9942	0.99960
	16.000	83.996	10.2184	3.8420	2.6597	0.5136	0.33302		4.000	21.684	1.3640	1.2471	1.0937	2.8911	0.99696

Oblique Shock p10

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	
3.10	6.000	23.258	1.5815	1.3835	1.1431	2.7894	0.99027	3.15	28.000	47.216	6.0688	3.1000	1.9577	1.6194	0.57808	
	8.000	24.927	1.8249	1.5271	1.1950	2.6981	0.97822	30.000	30.000	54.409	6.7158	3.2475	2.0680	1.4886	0.52806	
	10.000	26.692	2.0956	1.6767	1.2499	2.5964	0.96004	32.000	32.000	54.201	7.4487	3.3975	2.1924	1.3441	0.47738	
	12.000	28.554	2.3949	1.8308	1.3081	2.4837	0.93546	34.000	34.000	59.196	8.3736	3.5650	2.3489	1.1632	0.42162	
	14.000	30.513	2.7236	1.9879	1.3701	2.3798	0.90473	35.033	35.033	65.382	9.4008	3.7274	2.5221	0.9575	0.36898	
	16.000	32.574	3.0831	2.1467	1.4362	2.2743	0.86841	34.000	34.000	70.719	10.1474	3.8325	2.6478	0.7974	0.33596	
	18.000	34.739	3.4740	2.3057	1.5067	2.1672	0.82741	32.000	32.000	74.089	10.5396	3.8839	2.7137	0.7064	0.32016	
	20.000	37.017	3.8973	2.4637	1.5819	2.0581	0.78278	30.000	30.000	76.244	10.7550	3.9111	2.7499	0.6531	0.31190	
	22.000	39.421	4.3543	2.6198	1.6621	1.9468	0.73556	28.000	28.000	77.906	10.9014	3.9292	2.7745	0.6152	0.30644	
	24.000	41.968	4.8470	2.7733	1.7477	1.8329	0.68676	26.000	26.000	79.289	11.0097	3.9424	2.7927	0.5860	0.30248	
	26.000	44.692	5.3788	2.9241	1.8395	1.7154	0.63718	24.000	24.000	80.490	11.0936	3.9524	2.8068	0.5627	0.29947	
	28.000	47.646	5.9563	3.0727	1.9385	1.5928	0.58731	22.000	22.000	81.560	11.1602	3.9604	2.8180	0.5436	0.29710	
	30.000	50.935	6.5922	3.2205	2.0470	1.4620	0.53722	20.000	20.000	82.535	11.2142	3.9668	2.8270	0.5278	0.29520	
	32.000	54.800	7.3197	3.3723	2.1705	1.3157	0.48586	18.000	18.000	83.436	11.2583	3.9720	2.8344	0.5145	0.29366	
	34.000	60.205	8.2768	3.5485	2.3325	1.1241	0.42706	16.000	16.000	84.279	11.2945	3.9762	2.8405	0.5035	0.29240	
	34.726	65.335	9.0925	3.6810	2.4701	0.9564	0.38385	14.000	14.000	85.076	11.3243	3.9797	2.8455	0.4942	0.29138	
	34.000	69.872	9.7174	3.7732	2.5754	0.8203	0.35449	12.000	12.000	85.838	11.3486	3.9825	2.8496	0.4865	0.29054	
	32.000	73.661	10.1577	3.8339	2.6495	0.7171	0.33553	10.000	10.000	86.571	11.3682	3.9848	2.8529	0.4803	0.28987	
	30.000	75.938	10.3831	3.8636	2.6874	0.6607	0.32634	8.000	8.000	87.281	11.3835	3.9866	2.8555	0.4754	0.28935	
	28.000	77.666	10.5334	3.8831	2.7126	0.6212	0.32040	6.000	6.000	87.976	11.3951	3.9879	2.8574	0.4716	0.28895	
26.000	79.091	10.6435	3.8971	2.7311	0.5911	0.31614	4.000	4.000	88.657	11.4032	3.9889	2.8588	0.4690	0.28867		
24.000	80.324	10.7282	3.9077	2.7454	0.5671	0.31291	2.000	2.000	89.330	11.4080	3.9894	2.8596	0.4674	0.28851		
22.000	81.419	10.7954	3.9161	2.7567	0.5476	0.31038										
20.000	82.413	10.8496	3.9228	2.7658	0.5314	0.30836										
18.000	83.331	10.8938	3.9282	2.7732	0.5179	0.30672	3.20	2.000	19.587	1.1760	1.1760	1.0475	3.0901	0.99957		
16.000	84.189	10.9301	3.9327	2.7793	0.5067	0.30539	4.000	4.000	21.059	1.3759	1.3759	1.0965	2.9831	0.99670		
14.000	85.001	10.9599	3.9363	2.7843	0.4973	0.30430	6.000	6.000	22.628	1.6017	1.6017	1.1475	2.8776	0.98944		
12.000	85.775	10.9842	3.9393	2.7884	0.4895	0.30341	8.000	8.000	24.292	1.8552	1.8552	1.2013	2.7725	0.97642		
10.000	86.520	11.0037	3.9416	2.7917	0.4832	0.30270	10.000	10.000	26.052	2.1377	2.1377	1.2582	2.6670	0.95684		
8.000	87.242	11.0190	3.9435	2.7942	0.4781	0.30215	12.000	12.000	27.909	2.4507	2.4507	1.3188	2.5605	0.93048		
6.000	87.945	11.0306	3.9449	2.7962	0.4743	0.30173	14.000	14.000	29.863	2.7952	2.7952	1.3834	2.4528	0.89766		
4.000	88.637	11.0387	3.9458	2.7975	0.4716	0.30144	16.000	16.000	31.915	3.1723	3.1723	1.4524	2.3437	0.85914		
2.000	89.321	11.0434	3.9464	2.7983	0.4701	0.30127	18.000	18.000	34.071	3.5828	3.5828	1.5261	2.2329	0.81591		
							20.000	20.000	36.335	4.0273	4.0273	1.6048	2.1205	0.76919		
							22.000	22.000	38.718	4.5073	4.5073	1.6888	2.0061	0.72014		
							24.000	24.000	41.238	5.0245	5.0245	1.7784	1.8893	0.66984		
							26.000	26.000	43.920	5.5816	5.5816	1.8743	1.7695	0.61919		
							28.000	28.000	46.811	6.1840	6.1840	1.9774	1.6454	0.56880		
							30.000	30.000	49.994	6.8427	6.8427	2.0895	1.5144	0.51885		
							32.000	32.000	53.651	7.5832	7.5832	2.2152	1.3711	0.46873		
							34.000	34.000	58.350	8.4906	8.4906	2.3686	1.1976	0.41516		
							35.327	35.327	65.428	9.7141	9.7141	2.5748	0.9585	0.35463		
							36.000	36.000	71.408	10.5657	10.5657	2.7181	0.7791	0.31914		
							38.000	38.000	74.475	10.9242	10.9242	2.7783	0.6967	0.30560		
							40.000	40.000	76.526	11.1314	11.1314	2.8131	0.6461	0.29812		
							42.000	42.000	78.130	11.2746	11.2746	2.8372	0.6096	0.29310		
							44.000	44.000	79.475	11.3814	11.3814	2.8551	0.5812	0.28942		
							46.000	46.000	80.646	11.4644	11.4644	2.8690	0.5585	0.28660		

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$
3.20	22.000	81.694	11.5307	4.0035	2.8802	0.5398	0.28438	3.30	2.000	19.009	1.1812	1.1262	1.0489	3.1858	0.99953
	20.000	82.649	11.5844	4.0096	2.8892	0.5243	0.28260		4.000	20.475	1.3880	1.2626	1.0993	3.0748	0.99642
	18.000	83.533	11.6285	4.0146	2.8966	0.5113	0.28115		6.000	22.039	1.6222	1.4082	1.1520	2.9653	0.98858
	16.000	84.363	11.6647	4.0187	2.9026	0.5004	0.27996		8.000	23.699	1.8859	1.5617	1.2076	2.8563	0.97453
	14.000	85.147	11.6945	4.0220	2.9076	0.4913	0.27899		10.000	25.457	2.1807	1.7216	1.2666	2.7468	0.95347
	12.000	85.897	11.7188	4.0247	2.9117	0.4837	0.27820		12.000	27.310	2.5078	1.8861	1.3296	2.6364	0.92526
	10.000	86.619	11.7385	4.0269	2.9150	0.4776	0.27757		14.000	29.261	2.8688	2.0536	1.3970	2.5248	0.89031
	8.000	87.320	11.7539	4.0286	2.9176	0.4727	0.27707		16.000	31.308	3.2640	2.2219	1.4690	2.4118	0.84954
	6.000	88.003	11.7655	4.0299	2.9196	0.4690	0.27669		18.000	33.456	3.6947	2.3898	1.5460	2.2974	0.80409
	4.000	88.675	11.7736	4.0308	2.9209	0.4664	0.27643		20.000	35.710	4.1617	2.5557	1.6284	2.1813	0.75527
	2.000	89.340	11.7784	4.0313	2.9217	0.4649	0.27628		22.000	38.077	4.6655	2.7184	1.7163	2.0636	0.70444
									24.000	40.573	5.2081	2.8773	1.8101	1.9439	0.65272
								26.000	43.222	5.7918	3.0318	1.9103	1.8215	0.60108	
3.25	2.000	19.293	1.1786	1.1244	1.0482	3.1380	0.99955		28.000	46.062	6.4212	3.1822	2.0178	1.6955	0.55020
	4.000	20.762	1.3818	1.2586	1.0979	3.0290	0.99656		30.000	49.163	7.1057	3.3294	2.1342	1.5638	0.50034
	6.000	22.328	1.6119	1.4019	1.1498	2.9215	0.98902		32.000	52.667	7.8658	3.4758	2.2630	1.4218	0.45116
	8.000	23.990	1.8704	1.5530	1.2044	2.8145	0.97549		34.000	56.963	8.7622	3.6291	2.4144	1.2575	0.40064
	10.000	25.749	2.1590	1.7103	1.2624	2.7070	0.95518		35.882	65.518	10.3564	3.8602	2.6829	0.9606	0.32741
	12.000	27.604	2.4791	1.8722	1.3242	2.5986	0.92789		34.000	72.501	11.3896	3.9873	2.8565	0.7502	0.28914
	14.000	29.556	2.8318	2.0370	1.3901	2.4889	0.89402		32.000	75.148	11.7036	4.0230	2.9092	0.6797	0.27869
	16.000	31.606	3.2179	2.2030	1.4607	2.3779	0.85437		28.000	77.029	11.8983	4.0445	2.9418	0.6396	0.27247
	18.000	33.757	3.6384	2.3687	1.5360	2.2653	0.81004		26.000	78.535	12.0364	4.0595	2.9650	0.5993	0.26817
	20.000	36.016	4.0940	2.5326	1.6165	2.1511	0.76227		24.000	79.812	12.1408	4.0706	2.9825	0.5725	0.26497
	22.000	38.390	4.5858	2.6937	1.7024	2.0350	0.71232		22.000	80.932	12.2227	4.0793	2.9963	0.5507	0.26251
	24.000	40.898	5.1156	2.8513	1.7941	1.9168	0.66129		20.000	81.938	12.2884	4.0862	3.0073	0.5328	0.26055
26.000	43.563	5.6858	3.0049	1.8922	1.7958	0.61015		18.000	82.859	12.3420	4.0918	3.0163	0.5178	0.25896	
28.000	46.426	6.3015	3.1548	1.9974	1.6707	0.55950		16.000	83.714	12.3860	4.0964	3.0236	0.5052	0.25767	
30.000	49.566	6.9727	3.3020	2.1116	1.5394	0.50960		14.000	84.517	12.4223	4.1001	3.0297	0.4946	0.25662	
32.000	53.141	7.7223	3.4494	2.2387	1.3970	0.45998		12.000	85.278	12.4523	4.1032	3.0348	0.4858	0.25575	
34.000	57.616	8.6213	3.6062	2.3907	1.2287	0.40809		10.000	86.007	12.4767	4.1057	3.0389	0.4785	0.25504	
35.610	65.473	10.0327	3.8170	2.6285	0.9596	0.34078		8.000	86.708	12.4964	4.1077	3.0422	0.4725	0.25448	
34.000	71.993	10.9786	3.9386	2.7875	0.7636	0.30361		6.000	87.390	12.5120	4.1093	3.0448	0.4677	0.25403	
32.000	74.827	11.3120	3.9783	2.8434	0.6878	0.29180		4.000	88.056	12.5237	4.1105	3.0467	0.4641	0.25369	
30.000	76.787	11.5124	4.0014	2.8771	0.6396	0.28499		2.000	88.710	12.5319	4.1114	3.0481	0.4616	0.25346	
28.000	78.339	11.6529	4.0173	2.9007	0.6043	0.28035			89.357	12.5367	4.1119	3.0489	0.4601	0.25332	
26.000	79.649	11.7584	4.0291	2.9184	0.5767	0.27692									
24.000	80.793	11.8408	4.0382	2.9322	0.5545	0.27429									
22.000	81.819	11.9067	4.0454	2.9433	0.5362	0.27220									
20.000	82.757	11.9604	4.0513	2.9523	0.5210	0.27052		3.35	2.000	18.734	1.1839	1.1280	1.0496	3.2336	0.99951
18.000	83.626	12.0044	4.0560	2.9596	0.5082	0.26916		4.000	20.197	20.475	1.3940	1.2664	1.1007	3.1206	0.99628
16.000	84.442	12.0407	4.0599	2.9657	0.4974	0.26804		6.000	21.759	22.039	1.6326	1.4144	1.1543	3.0090	0.98812
14.000	85.214	12.0705	4.0631	2.9707	0.4885	0.26712		8.000	23.418	23.699	1.9015	1.5704	1.2108	2.8980	0.977354
12.000	85.953	12.0949	4.0658	2.9748	0.4810	0.26637		10.000	25.175	25.457	2.2025	1.7330	1.2709	2.7865	0.95172
10.000	86.665	12.1145	4.0679	2.9781	0.4750	0.26577		12.000	27.028	27.310	2.5370	1.9002	1.3351	2.6741	0.92257
8.000	87.356	12.1300	4.0695	2.9807	0.4702	0.26530		14.000	28.976	29.261	2.9061	2.0701	1.4038	2.5604	0.88654
6.000	88.030	12.1417	4.0707	2.9827	0.4665	0.26495		16.000	31.022	31.456	3.3109	2.2410	1.4774	2.4454	0.84462
4.000	88.693	12.1498	4.0716	2.9840	0.4639	0.26470		18.000	33.167	33.710	3.7520	2.4110	1.5562	2.3290	0.79804
2.000	89.348	12.1547	4.0721	2.9848	0.4624	0.26455		20.000	35.416	35.963	4.2303	2.5788	1.6404	2.2112	0.74822
								22.000	37.776	37.776	4.7466	2.7431	1.7303	2.0917	0.69650

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
3.35	24.000	40.264	5.3024	2.9033	1.8263	1.9704	0.64409	3.40	34.000	73.352	12.2131	4.0783	2.9946	0.7279	0.26279
	26.000	42.898	5.8998	3.0588	1.9288	1.8468	0.59200		32.000	75.717	12.4992	4.1080	3.0426	0.6653	0.25440
	28.000	45.716	6.5433	3.2097	2.0386	1.7198	0.54090		30.000	77.467	12.6849	4.1268	3.0738	0.6225	0.24914
	30.000	48.782	7.2416	3.3568	2.1573	1.5874	0.49109		28.000	78.891	12.8193	4.1402	3.0963	0.5902	0.24542
	32.000	52.225	8.0134	3.5024	2.2880	1.4458	0.44232		26.000	80.110	12.9221	4.1503	3.1135	0.5646	0.24263
	34.000	56.375	8.9114	3.6528	2.4396	1.2844	0.39294		24.000	81.185	13.0033	4.1582	3.1271	0.5437	0.24046
	36.000	63.380	10.2976	3.8524	2.6730	1.0339	0.32979		22.000	82.156	13.0688	4.1645	3.1381	0.5264	0.23872
	36.143	65.562	10.6853	3.9023	2.7382	0.9616	0.31454		20.000	83.047	13.1224	4.1697	3.1471	0.5119	0.23732
	36.000	67.623	11.0286	3.9446	2.7958	0.8957	0.30180		18.000	83.876	13.1665	4.1739	3.1545	0.4997	0.23617
	34.000	72.950	11.8006	4.0338	2.9255	0.7384	0.27557		16.000	84.656	13.2030	4.1774	3.1606	0.4894	0.23522
	32.000	75.444	12.0992	4.0662	2.9755	0.6723	0.26624		14.000	85.396	13.2331	4.1802	3.1657	0.4808	0.23445
	30.000	77.255	12.2891	4.0863	3.0074	0.6279	0.26053		12.000	86.105	13.2578	4.1826	3.1698	0.4736	0.23381
	28.000	78.719	12.4252	4.1004	3.0302	0.5946	0.25653		10.000	86.789	13.2777	4.1844	3.1731	0.4678	0.23330
	26.000	79.965	12.5287	4.1110	3.0476	0.5684	0.25355		8.000	87.453	13.2934	4.1859	3.1757	0.4632	0.23290
	24.000	81.062	12.6102	4.1193	3.0612	0.5471	0.25124		6.000	88.103	13.3052	4.1870	3.1777	0.4596	0.23260
	22.000	82.050	12.6758	4.1259	3.0722	0.5295	0.24939		4.000	88.741	13.3135	4.1878	3.1791	0.4572	0.23239
	20.000	82.956	12.7293	4.1313	3.0812	0.5148	0.24790		2.000	89.372	13.3184	4.1883	3.1799	0.4557	0.23227
	18.000	83.798	12.7734	4.1357	3.0886	0.5024	0.24668								
16.000	84.588	12.8098	4.1399	3.0947	0.4920	0.24568									
14.000	85.339	12.8398	4.1422	3.0997	0.4832	0.24486		3.45	2.000	18.209	1.1892	1.1316	1.0509	3.3292	0.99947
12.000	86.057	12.8644	4.1446	3.1038	0.4760	0.24420		4.000	4.000	19.668	1.4063	1.2743	1.1036	3.2118	0.99597
10.000	86.750	12.8842	4.1466	3.1072	0.4701	0.24366		6.000	21.226	21.226	1.6536	1.4270	1.1588	3.0962	0.98718
8.000	87.422	12.8998	4.1481	3.1098	0.4654	0.24324		8.000	22.884	22.884	1.9331	1.5881	1.2172	2.9809	0.97819
6.000	88.080	12.9116	4.1493	3.1118	0.4618	0.24292		10.000	24.639	24.639	2.2468	1.7559	1.2796	2.8653	0.94812
4.000	88.726	12.9198	4.1501	3.1131	0.4593	0.24270		12.000	26.491	26.491	2.5962	1.9284	1.3463	2.7486	0.91701
2.000	89.365	12.9246	4.1506	3.1140	0.4578	0.24256		14.000	28.438	28.438	2.9823	2.1035	1.4178	2.6309	0.87878
								16.000	30.481	30.481	3.4063	2.2791	1.4946	2.5118	0.83456
								18.000	32.621	32.621	3.8688	2.4535	1.5769	2.3915	0.78577
3.40	2.000	18.467	1.1866	1.1298	1.0502	3.2814	0.99949	20.000	34.863	34.863	4.3706	2.6251	1.6649	2.2698	0.73391
	4.000	19.928	1.4001	1.2704	1.1022	3.1662	0.99613	22.000	37.213	37.213	4.9123	2.7926	1.7590	2.1468	0.68049
	6.000	21.488	1.6430	1.4207	1.1565	3.0527	0.98766	24.000	39.683	39.683	5.4951	2.9552	1.8595	2.0224	0.62680
	8.000	23.147	1.9173	1.5793	1.2140	2.9395	0.97253	26.000	42.292	42.292	6.1211	3.1125	1.9666	1.8960	0.57385
	10.000	24.902	2.2245	1.7444	1.2752	2.8260	0.94995	28.000	45.073	45.073	6.7941	3.2644	2.0813	1.7667	0.52235
	12.000	26.755	2.5664	1.9143	1.3407	2.7115	0.91981	30.000	48.080	48.080	7.5215	3.4115	2.2047	1.6329	0.47267
	14.000	28.702	2.9440	2.0868	1.4108	2.5958	0.88269	32.000	51.420	51.420	8.3194	3.5558	2.3397	1.4914	0.42466
	16.000	30.746	3.3583	2.2600	1.4860	2.4788	0.83962	34.000	55.344	55.344	9.2294	3.7018	2.4932	1.3339	0.37715
	18.000	32.889	3.8100	2.4322	1.5665	2.3604	0.79194	36.000	60.903	60.903	10.4358	3.8705	2.6962	1.1265	0.32424
	20.000	35.133	4.2998	2.6019	1.6526	2.2407	0.74110	36.635	65.647	65.647	11.3584	3.9837	2.8512	0.9634	0.29020
	22.000	37.489	4.8289	2.7679	1.7446	2.1195	0.68851	36.000	69.850	69.850	12.0718	4.0633	2.9709	0.8302	0.26708
	24.000	39.967	5.3980	2.9293	1.8428	1.9966	0.63546	34.000	73.716	73.716	12.6278	4.1211	3.0642	0.7184	0.25074
	26.000	42.588	6.0096	3.0857	1.9476	1.8716	0.58292	32.000	75.970	75.970	12.9035	4.1485	3.1104	0.6589	0.24313
	28.000	45.386	6.6675	3.2370	2.0598	1.7435	0.53162	30.000	77.665	77.665	13.0858	4.1662	3.1410	0.6175	0.23828
	30.000	48.422	7.3802	3.3842	2.1808	1.6105	0.48186	28.000	79.054	79.054	13.2189	4.1789	3.1633	0.5860	0.23481
	32.000	51.810	8.1645	3.5290	2.3135	1.4690	0.43348	26.000	80.246	80.246	13.3210	4.1885	3.1804	0.5609	0.23220
	34.000	55.838	9.0673	3.6771	2.4659	1.3098	0.38509	24.000	81.302	81.302	13.4020	4.1961	3.1939	0.5404	0.23016
	36.000	61.914	10.3308	3.8568	2.6786	1.0874	0.32845	22.000	82.256	82.256	13.4675	4.2021	3.2049	0.5234	0.22852
36.393	65.605	11.0193	3.9435	2.7943	0.9625	0.30214	20.000	83.134	83.134	13.5211	4.2071	3.2139	0.5091	0.22719	
36.000	68.960	11.5817	4.0093	2.8887	0.8560	0.28269	18.000	83.951	83.951	13.5654	4.2111	3.2213	0.4971	0.22611	

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
3.45	16.000	84.720	13.6020	4.2145	3.2275	0.4869	0.22521	3.55	2.000	17.715	1.1947	1.1353	1.0523	3.4246	0.99943
	14.000	85.451	13.6322	4.2172	3.2325	0.4784	0.22448		4.000	19.170	1.4187	1.2822	1.1065	3.3029	0.99566
	12.000	86.151	13.6570	4.2195	3.2367	0.4714	0.22388		6.000	20.726	1.6748	1.4396	1.1634	3.1829	0.98619
	10.000	86.826	13.6770	4.2213	3.2400	0.4656	0.22340		8.000	22.383	1.9653	1.6059	1.2238	3.0633	0.96935
	8.000	87.482	13.6928	4.2227	3.2427	0.4610	0.22302		10.000	24.138	2.2920	1.7791	1.2883	2.9433	0.94435
	6.000	88.125	13.7047	4.2238	3.2447	0.4575	0.22273		12.000	25.989	2.6566	1.9569	1.3576	2.8224	0.91123
	4.000	88.756	13.7130	4.2245	3.2461	0.4551	0.22253		14.000	27.936	3.0603	2.1370	1.4321	2.7003	0.87077
	2.000	89.379	13.7180	4.2250	3.2469	0.4536	0.22241		16.000	29.977	3.5040	2.3174	1.5121	2.5771	0.82424
									18.000	32.115	3.9887	2.4961	1.5980	2.4526	0.77322
									20.000	34.352	4.5148	2.6714	1.6901	2.3271	0.71939
3.50	2.000	17.958	1.1920	1.1335	1.0516	3.3769	0.99945		22.000	36.692	5.0827	2.8419	1.7885	2.2005	0.66437
	4.000	19.415	1.4125	1.2783	1.1050	3.2574	0.99582		24.000	39.149	5.6937	3.0069	1.8935	2.0727	0.60946
	6.000	20.972	1.6642	1.4333	1.1611	3.1396	0.98669		26.000	41.738	6.3495	3.1659	2.0056	1.9434	0.55575
	8.000	22.629	1.9491	1.5970	1.2205	3.0222	0.97044		28.000	44.488	7.0535	3.3187	2.1254	1.8117	0.50395
	10.000	24.384	2.2693	1.7675	1.2839	2.9044	0.94626		30.000	47.447	7.8120	3.4660	2.2539	1.6762	0.45445
	12.000	26.236	2.6262	1.9426	1.3519	2.7856	0.91415		32.000	50.705	8.6392	3.6092	2.3937	1.5342	0.40714
	14.000	28.182	3.0211	2.1202	1.4249	2.6657	0.87481		34.000	54.463	9.5691	3.7520	2.5504	1.3790	0.36118
	16.000	30.225	3.4549	2.2982	1.5033	2.5445	0.82942		36.000	59.399	10.7262	3.9075	2.7450	1.1885	0.31299
	18.000	32.363	3.9283	2.4747	1.5874	2.4222	0.77952		37.000	65.729	12.0520	4.0612	2.9676	1.0651	0.26768
	20.000	34.602	4.4421	2.6482	1.6774	2.2986	0.72668		38.000	71.121	12.9969	4.1576	3.1261	0.9943	0.24063
3.60	2.000	36.947	4.9669	2.8173	1.7737	2.1739	0.67245		34.000	74.353	13.4667	4.2021	3.2048	0.7018	0.22854
	4.000	39.410	5.5936	2.9811	1.8764	2.0478	0.61813		32.000	76.427	13.7265	4.2257	3.2483	0.6473	0.22221
	6.000	42.009	6.2345	3.1392	1.9860	1.9199	0.56478		30.000	78.025	13.9033	4.2415	3.2779	0.6083	0.21803
	8.000	44.774	6.9227	3.2916	2.1032	1.7894	0.51313		28.000	79.351	14.0342	4.2530	3.2998	0.5782	0.21501
	10.000	47.755	7.6654	3.4388	2.2291	1.6549	0.46353		26.000	80.497	14.1355	4.2618	3.3168	0.5541	0.21271
	12.000	51.053	8.4777	3.5825	2.3664	1.5131	0.41586		24.000	81.517	14.2163	4.2687	3.3303	0.5343	0.21090
	14.000	54.888	9.3968	3.7268	2.5214	1.3570	0.36917		22.000	82.442	14.2819	4.2743	3.3413	0.5178	0.20944
	16.000	60.090	10.5715	3.8879	2.7191	1.1594	0.31891		20.000	83.294	14.3358	4.2789	3.3503	0.5039	0.20826
	18.000	65.689	11.7027	4.0229	2.9090	0.9643	0.27872		18.000	84.090	14.3804	4.2827	3.3578	0.4922	0.20729
	20.000	70.545	12.5396	4.1121	3.0494	0.8105	0.25324		16.000	84.839	14.4173	4.2858	3.3640	0.4823	0.20649
3.70	2.000	74.048	13.0455	4.1623	3.1342	0.7098	0.23934		14.000	85.552	14.4478	4.2883	3.3691	0.4740	0.20583
	4.000	76.207	13.3126	4.1877	3.1790	0.6529	0.23241		12.000	86.235	14.4729	4.2904	3.3733	0.4671	0.20529
	6.000	77.851	13.4920	4.2044	3.2090	0.6128	0.22791		10.000	86.895	14.4931	4.2921	3.3767	0.4615	0.20485
	8.000	79.207	13.6238	4.2165	3.2311	0.5820	0.22468		8.000	87.537	14.5091	4.2934	3.3794	0.4570	0.20451
	10.000	80.375	13.7255	4.2256	3.2481	0.5574	0.22223		6.000	88.165	14.5212	4.2944	3.3814	0.4535	0.20425
	12.000	81.413	13.8064	4.2329	3.2617	0.5373	0.22031		4.000	88.782	14.5296	4.2951	3.3828	0.4511	0.20407
	14.000	82.352	13.8719	4.2387	3.2727	0.5205	0.21877		2.000	89.392	14.5346	4.2956	3.3836	0.4497	0.20397
	16.000	83.216	13.9256	4.2435	3.2817	0.5065	0.21751								
	18.000	84.022	13.9700	4.2474	3.2891	0.4946	0.21649								
	20.000	84.781	14.0067	4.2506	3.2952	0.4846	0.21564								
3.80	2.000	85.503	14.0371	4.2532	3.3003	0.4762	0.21494	3.60	2.000	17.479	1.1973	1.1371	1.0530	3.4722	0.99940
	4.000	86.194	14.0620	4.2554	3.3049	0.4692	0.21438		4.000	18.932	1.4250	1.2862	1.1079	3.3482	0.99549
	6.000	86.862	14.0822	4.2572	3.3079	0.4635	0.21392		6.000	20.488	1.6857	1.4461	1.1657	3.2260	0.98567
	8.000	87.510	14.0980	4.2585	3.3105	0.4590	0.21356		8.000	22.144	1.9816	1.6149	1.2271	3.1043	0.96824
	10.000	88.145	14.1100	4.2596	3.3125	0.4555	0.21329		10.000	23.899	2.3149	1.7907	1.2927	2.9821	0.94241
	12.000	88.769	14.1184	4.2603	3.3139	0.4531	0.21310		12.000	25.751	2.6873	1.9711	1.3633	2.8590	0.90827
	14.000	89.386	14.1234	4.2607	3.3148	0.4516	0.21298		14.000	27.698	3.0999	2.1538	1.4393	2.7347	0.86667
	16.000								16.000	29.740	3.5540	2.3366	1.5210	2.6092	0.81895
	18.000								18.000	31.876	4.0498	2.5174	1.6088	2.4827	0.76685
	20.000														

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	
3.60	20.000	34.110	4.5883	2.6945	1.7029	2.3552	0.71207	3.65	37.513	65.808	12.7662	4.1349	3.0874	0.9668	0.24688	
	22.000	36.448	5.1699	2.8666	1.8035	2.2267	0.65625	36.000	72.054	72.054	13.9006	4.2413	3.2775	0.7684	0.21810	
	24.000	38.898	5.7953	3.0327	1.9109	2.0973	0.60079	34.000	74.894	74.894	14.3206	4.2776	3.3478	0.6877	0.20859	
	26.000	41.478	6.4663	3.1924	2.0255	1.9664	0.54674	32.000	76.827	76.827	14.5690	4.2984	3.3894	0.6371	0.20324	
	28.000	44.215	7.1862	3.3457	2.1479	1.8335	0.49483	30.000	78.345	78.345	14.7420	4.3126	3.4183	0.6000	0.19962	
	30.000	47.153	7.9610	3.4930	2.2791	1.6971	0.44543	28.000	79.617	79.617	14.8713	4.3231	3.4400	0.5712	0.19697	
	32.000	50.376	8.8038	3.6357	2.4215	1.5547	0.39847	26.000	80.723	80.723	14.9723	4.3311	3.4569	0.5480	0.19493	
	34.000	54.066	9.7460	3.7772	2.5802	1.4002	0.35321	24.000	81.712	81.712	15.0533	4.3376	3.4705	0.5287	0.19332	
	36.000	58.793	10.8943	3.9283	2.7733	1.2149	0.30670	22.000	82.610	82.610	15.1191	4.3427	3.4815	0.5127	0.19202	
	37.306	65.769	12.4065	4.0985	3.0271	0.9660	0.25708	20.000	83.440	83.440	15.1734	4.3470	3.4906	0.4992	0.19096	
	36.000	71.617	13.4496	4.2005	3.2019	0.7805	0.22897	18.000	84.215	84.215	15.2184	4.3505	3.4981	0.4877	0.19009	
	34.000	74.634	13.8916	4.2405	3.2760	0.6945	0.21831	16.000	84.947	84.947	15.2557	4.3534	3.5043	0.4781	0.18937	
	32.000	76.633	14.1452	4.2626	3.3184	0.6420	0.21249	14.000	85.644	85.644	15.2866	4.3558	3.5095	0.4699	0.18878	
	30.000	78.190	14.3199	4.2776	3.3477	0.6041	0.20861	12.000	86.313	86.313	15.3120	4.3577	3.5137	0.4632	0.18829	
	28.000	79.487	14.4500	4.2885	3.3695	0.5746	0.20578	10.000	86.959	86.959	15.3325	4.3593	3.5172	0.4576	0.18790	
	26.000	80.614	14.5512	4.2969	3.3864	0.5510	0.20362	8.000	87.587	87.587	15.3487	4.3606	3.5199	0.4532	0.18759	
	24.000	81.617	14.6320	4.3036	3.3999	0.5315	0.20191	6.000	88.201	88.201	15.3609	4.3615	3.5219	0.4499	0.18736	
	22.000	82.528	14.6976	4.3090	3.4109	0.5152	0.20054	4.000	88.807	88.807	15.3695	4.3622	3.5234	0.4475	0.18720	
	20.000	83.369	14.7517	4.3134	3.4200	0.5015	0.19942	2.000	89.405	89.405	15.3746	4.3625	3.5242	0.4461	0.18710	
	18.000	84.154	14.7965	4.3170	3.4275	0.4899	0.19849									
	16.000	84.894	14.8336	4.3200	3.4337	0.4801	0.19774									
	14.000	85.599	14.8643	4.3225	3.4388	0.4719	0.19711	3.70	2.000	17.027	17.027	1.2029	1.1408	1.0544	3.5674	0.99936
	12.000	86.275	14.8895	4.3245	3.4430	0.4651	0.19660	4.000	4.000	18.478	18.478	1.4377	1.2942	1.1108	3.4388	0.99515
	10.000	86.928	14.9099	4.3262	3.4465	0.4595	0.19619	6.000	6.000	20.032	20.032	1.7073	1.4589	1.1703	3.3121	0.98461
	8.000	87.562	14.9260	4.3274	3.4491	0.4551	0.19586	8.000	8.000	21.688	21.688	2.0146	1.6330	1.2337	3.1858	0.96594
	6.000	88.184	14.9381	4.3284	3.4512	0.4517	0.19562	10.000	10.000	23.444	23.444	2.3615	1.8141	1.3017	3.0591	0.93840
	4.000	88.794	14.9466	4.3291	3.4526	0.4493	0.19545	12.000	12.000	25.297	25.297	2.7496	1.9998	1.3749	2.9315	0.90218
	2.000	89.398	14.9517	4.3295	3.4534	0.4479	0.19535	14.000	14.000	27.246	27.246	3.1808	2.1877	1.4539	2.8026	0.85825
									16.000	29.287	29.287	3.6554	2.3751	1.5391	2.6728	0.80824
									18.000	31.423	31.423	4.1745	2.5600	1.6306	2.5420	0.75395
									20.000	33.653	33.653	4.7382	2.7406	1.7289	2.4105	0.69731
									22.000	35.985	35.985	5.3474	2.9156	1.8341	2.2783	0.64001
								24.000	38.426	38.426	6.0027	3.0840	1.9464	2.1453	0.58349	
								26.000	40.991	40.991	6.7053	3.2452	2.0662	2.0114	0.52883	
								28.000	43.704	43.704	7.4580	3.3993	2.1940	1.8758	0.47677	
								30.000	46.605	46.605	8.2664	3.5467	2.3307	1.7375	0.42765	
								32.000	49.768	49.768	9.1422	3.6886	2.4785	1.5940	0.38140	
								34.000	53.344	53.344	10.1123	3.8277	2.6418	1.4404	0.33742	
								36.000	57.660	57.660	11.2596	3.9721	2.8346	1.2623	0.29362	
								37.713	65.847	65.847	13.1309	4.1705	3.1485	1.0675	0.23710	
								36.000	72.443	72.443	14.3517	4.2802	3.3530	0.7577	0.20791	
								34.000	75.135	75.135	14.7539	4.3136	3.4203	0.6814	0.19937	
								32.000	77.009	77.009	14.9979	4.3332	3.4612	0.6324	0.19442	
								30.000	78.492	78.492	15.1693	4.3467	3.4899	0.5962	0.19104	
								28.000	79.740	79.740	15.2983	4.3567	3.5115	0.5680	0.18855	
								26.000	80.828	80.828	15.3992	4.3644	3.5283	0.5451	0.18654	
								24.000	81.802	81.802	15.4802	4.3706	3.5419	0.5261	0.18512	
								22.000	82.688	82.688	15.5463	4.3756	3.5530	0.5103	0.18389	





### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{P_2}{P_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{P_{02}}{P_{01}}$
3.85	10.000	22.812	2.4328	1.8495	1.3153	3.1794	0.93209	3.90	24.000	37.584	6.4345	3.1853	2.0201	2.2371	0.54918
	12.000	24.668	2.8456	2.0432	1.3927	3.0386	0.89264		26.000	40.126	7.2035	3.3492	2.1508	2.0968	0.49366
	14.000	26.619	3.3050	2.2386	1.4764	2.9028	0.84523		28.000	42.802	8.0258	3.5046	2.2901	1.9558	0.44158
	16.000	28.664	3.8121	2.4330	1.5668	2.7661	0.79172		30.000	45.646	8.9059	3.6519	2.4387	1.8131	0.39322
	18.000	30.799	4.3670	2.6239	1.6643	2.6287	0.73428		32.000	48.716	9.8536	3.7923	2.5983	1.6668	0.34848
	20.000	33.028	4.9706	2.8097	1.7691	2.4909	0.67493		34.000	52.126	10.8901	3.9278	2.7726	1.5130	0.30686
	22.000	35.353	5.6230	2.9887	1.8814	2.3529	0.61558		36.000	56.149	12.0723	4.0633	2.9710	1.3425	0.26706
	24.000	37.783	6.3245	3.1601	2.0013	2.2146	0.55770		38.000	62.087	13.6897	4.2224	3.2421	1.1106	0.22309
	26.000	40.330	7.0764	3.3234	2.1293	2.0760	0.50236		38.445	65.991	14.6407	4.3043	3.4014	0.9704	0.20173
	28.000	43.014	7.8808	3.4785	2.2656	1.9364	0.45026		38.000	69.501	15.4023	4.3647	3.5289	0.8527	0.18658
	30.000	45.871	8.7425	3.6259	2.4111	1.7948	0.40167		36.000	73.678	16.1768	4.4218	3.6584	0.7240	0.17273
	32.000	48.961	9.6715	3.7666	2.5677	1.6493	0.35654		34.000	75.956	16.5334	4.4668	3.7181	0.6600	0.16682
	34.000	52.407	10.6904	3.9030	2.7390	1.4957	0.31434		32.000	77.640	16.7653	4.4626	3.7569	0.6160	0.16313
	36.000	56.508	11.8605	4.0404	2.9355	1.3239	0.27366		30.000	79.006	16.9330	4.4738	3.7849	0.5828	0.16052
	38.000	62.939	13.5472	4.2095	3.2183	1.0767	0.22655		28.000	80.172	17.0613	4.4823	3.8064	0.5563	0.15857
	38.272	65.956	14.2556	4.2721	3.3369	0.9697	0.21003		26.000	81.199	17.1629	4.4890	3.8234	0.5347	0.15705
	38.000	68.733	14.8512	4.3214	3.4366	0.8764	0.19798		24.000	82.121	17.2449	4.4943	3.8371	0.5168	0.15583
	36.000	73.407	15.7160	4.3883	3.5814	0.7314	0.18079		22.000	82.966	17.3122	4.4986	3.8483	0.5016	0.15485
	34.000	75.770	16.0813	4.4150	3.6425	0.6649	0.17436		20.000	83.749	17.3680	4.5022	3.8576	0.4888	0.15404
	32.000	77.495	16.3155	4.4316	3.6816	0.6198	0.17039		18.000	84.483	17.4143	4.5052	3.8654	0.4780	0.15337
30.000	78.888	16.4839	4.4433	3.7098	0.5859	0.16762		16.000	85.177	17.4529	4.5076	3.8718	0.4688	0.15281	
28.000	80.072	16.6122	4.4522	3.7313	0.5591	0.16555		14.000	85.840	17.4850	4.5097	3.8772	0.4610	0.15235	
26.000	81.112	16.7195	4.4591	3.7482	0.5372	0.16394		12.000	86.477	17.5113	4.5114	3.8816	0.4545	0.15198	
24.000	82.047	16.7952	4.4646	3.7619	0.5190	0.16266		10.000	87.093	17.5327	4.5127	3.8852	0.4492	0.15167	
22.000	82.901	16.8622	4.4691	3.7731	0.5037	0.16162		8.000	87.693	17.5496	4.5138	3.8880	0.4450	0.15143	
20.000	83.692	16.9175	4.4728	3.7823	0.4907	0.16076		6.000	88.280	17.5623	4.5146	3.8901	0.4418	0.15125	
18.000	84.434	16.9636	4.4758	3.7900	0.4798	0.16006		4.000	88.858	17.5713	4.5151	3.8916	0.4395	0.15113	
16.000	85.136	17.0019	4.4784	3.7964	0.4705	0.15947		2.000	89.430	17.5766	4.5155	3.8925	0.4382	0.15105	
14.000	85.804	17.0337	4.4805	3.8017	0.4627	0.15899									
12.000	86.447	17.0598	4.4822	3.8061	0.4561	0.15859									
10.000	87.068	17.0810	4.4836	3.8097	0.4508	0.15827		3.95	2.000	16.001	1.2166	1.1500	1.0578	3.8047	0.99923
8.000	87.674	17.0978	4.4847	3.8125	0.4465	0.15802			4.000	17.447	1.4697	1.3144	1.1182	3.6641	0.99421
6.000	88.266	17.1104	4.4855	3.8146	0.4433	0.15783			6.000	19.001	1.7630	1.4915	1.1821	3.5255	0.98171
4.000	88.849	17.1193	4.4861	3.8161	0.4410	0.15770			8.000	20.660	2.0992	1.6786	1.2506	3.3874	0.95977
2.000	89.426	17.1245	4.4865	3.8169	0.4397	0.15762			10.000	22.422	2.4815	1.8734	1.3246	3.2486	0.92768
									12.000	24.280	2.9112	2.0724	1.4048	3.1090	0.88602
									14.000	26.234	3.3902	2.2727	1.4917	2.9684	0.83626
									16.000	28.281	3.9194	2.4716	1.5858	2.8270	0.78046
3.90	2.000	16.196	1.2138	1.1482	1.0571	3.7573	0.99926		18.000	30.417	4.4992	2.6664	1.6874	2.6851	0.72095
4.000	4.000	17.642	1.4633	1.3104	1.1167	3.6191	0.99441		20.000	32.646	5.1304	2.8554	1.7967	2.5430	0.65932
6.000	8.000	19.196	1.7517	1.4849	1.1797	3.4830	0.98232		22.000	34.969	5.8125	3.0370	1.9139	2.4010	0.59933
8.000	20.854	20.854	2.0821	1.6694	1.2472	3.3473	0.96105		24.000	37.393	6.5462	3.2103	2.0391	2.2591	0.54068
10.000	22.614	22.614	2.4570	1.8614	1.3200	3.2111	0.92990		26.000	39.929	7.3323	3.3748	2.1727	2.1172	0.48503
12.000	24.472	24.472	2.8783	2.0578	1.3987	3.0739	0.88935		28.000	42.598	8.1726	3.5304	2.3149	1.9748	0.43302
14.000	26.424	26.424	3.3474	2.2557	1.4840	2.9357	0.84077		30.000	45.431	9.0717	3.6778	2.4666	1.8310	0.38488
16.000	28.469	28.469	3.8655	2.4523	1.5763	2.7987	0.78611		32.000	48.483	10.0386	3.8178	2.6294	1.6838	0.34053
18.000	30.605	30.605	4.4329	2.6452	1.6758	2.6570	0.72761		34.000	51.859	11.0931	3.9524	2.8067	1.5299	0.29949
20.000	32.834	32.834	5.0501	2.8326	1.7828	2.5171	0.66743		36.000	55.812	12.2888	4.0863	3.0073	1.3604	0.26054
22.000	35.157	35.157	5.7171	3.0129	1.8975	2.3771	0.60746								

### Oblique Shock Tables ( $\gamma = 1.4$ )

$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$	$M_1$	$\theta$	$\beta$	$\frac{p_2}{p_1}$	$\frac{\rho_2}{\rho_1}$	$\frac{T_2}{T_1}$	$M_2$	$\frac{p_{02}}{p_{01}}$
3.95	38.000	61.406	13.8667	4.2383	3.2718	1.1389	0.21889	4.00	28.000	80.359	17.9765	4.5402	3.9594	0.5513	0.14555
	38.612	66.026	15.0309	4.3358	3.4667	0.9711	0.19376		26.000	81.359	18.0787	4.5464	3.9765	0.5302	0.14419
	39.000	70.101	15.9275	4.4038	3.6167	0.8345	0.17703		24.000	82.261	18.1615	4.5514	3.9903	0.5126	0.14310
	39.000	73.928	16.6412	4.4541	3.7361	0.7172	0.16509		22.000	83.087	18.2296	4.5555	4.0017	0.4978	0.14221
	34.000	76.131	16.9904	4.4776	3.7945	0.6554	0.15965		20.000	83.854	18.2861	4.5588	4.0111	0.4852	0.14148
	32.000	77.777	17.2203	4.4927	3.8330	0.6125	0.15620		18.000	84.574	18.3331	4.5616	4.0190	0.4746	0.14087
	30.000	79.120	17.3877	4.5035	3.8609	0.5798	0.15375		16.000	85.256	18.3723	4.5639	4.0255	0.4655	0.14037
	28.000	80.268	17.5161	4.5117	3.8824	0.5537	0.15191		14.000	85.907	18.4049	4.5659	4.0310	0.4579	0.13996
	26.000	81.281	17.6179	4.5181	3.8994	0.5324	0.15047		12.000	86.533	18.4317	4.5674	4.0355	0.4515	0.13962
	24.000	82.192	17.7003	4.5232	3.9132	0.5147	0.14932		10.000	87.139	18.4535	4.5687	4.0391	0.4463	0.13934
	22.000	83.028	17.7680	4.5274	3.9245	0.4997	0.14838		8.000	87.730	18.4707	4.5697	4.0420	0.4421	0.13912
	20.000	83.803	17.8241	4.5309	3.9339	0.4870	0.14761		6.000	88.307	18.4837	4.5705	4.0442	0.4390	0.13896
	18.000	84.529	17.8708	4.5338	3.9417	0.4762	0.14698		4.000	88.876	18.4928	4.5710	4.0457	0.4367	0.13885
	16.000	85.218	17.9097	4.5362	3.9482	0.4671	0.14645		2.000	89.439	18.4982	4.5713	4.0466	0.4354	0.13878
	14.000	85.874	17.9420	4.5381	3.9536	0.4594	0.14601								
	12.000	86.505	17.9686	4.5398	3.9581	0.4530	0.14566								
	10.000	87.116	17.9902	4.5411	3.9617	0.4477	0.14537								
	8.000	87.711	18.0072	4.5421	3.9645	0.4435	0.14514								
	6.000	88.294	18.0201	4.5429	3.9667	0.4404	0.14497								
	4.000	88.868	18.0291	4.5434	3.9682	0.4381	0.14485								
	2.000	89.435	18.0345	4.5438	3.9691	0.4368	0.14478								
4.00	2.000	15.813	1.2194	1.1519	1.0586	3.8521	0.99920								
	4.000	17.258	1.4763	1.3185	1.1196	3.7089	0.99401								
	6.000	18.812	1.7743	1.4980	1.1844	3.5679	0.98110								
	8.000	20.471	2.1166	1.6879	1.2540	3.4273	0.95845								
	10.000	22.234	2.5061	1.8853	1.3293	3.2860	0.92542								
	12.000	24.095	2.9445	2.0870	1.4109	3.1439	0.88264								
	14.000	26.050	3.4334	2.2898	1.4994	3.0009	0.83170								
	16.000	28.098	3.9741	2.4909	1.5954	2.8570	0.77474								
	18.000	30.236	4.5667	2.6877	1.6991	2.7128	0.71422								
	20.000	32.464	5.2116	2.8782	1.8107	2.5686	0.65240								
	22.000	34.786	5.9090	3.0611	1.9304	2.4246	0.59123								
	24.000	37.208	6.6592	3.2352	2.0583	2.2809	0.53224								
	26.000	39.740	7.4625	3.4002	2.1947	2.1374	0.47648								
	28.000	42.402	8.3215	3.5561	2.3401	1.9935	0.42453								
	30.000	45.224	9.2397	3.7034	2.4949	1.8485	0.37666								
	32.000	48.258	10.2259	3.8430	2.6609	1.7006	0.33272								
	34.000	51.605	11.2995	3.9768	2.8413	1.5463	0.29223								
	36.000	55.495	12.5100	4.1091	3.0444	1.3776	0.25409								
	38.000	60.827	14.0647	4.2556	3.3049	1.1637	0.21432								
	38.774	66.059	15.4261	4.3665	3.5329	0.9717	0.18613								
	38.000	70.601	16.4407	4.4403	3.7026	0.8196	0.16833								
	36.000	74.161	17.1095	4.4855	3.8144	0.7109	0.15785								
	34.000	76.297	17.4525	4.5076	3.8718	0.6511	0.15282								
	32.000	77.908	17.6808	4.5220	3.9099	0.6090	0.14959								
	30.000	79.227	17.8479	4.5324	3.9379	0.5769	0.14729								