## Answers

2(a) $r^4 e^{4i\theta}$ ; $\sqrt{r}e^{i\theta/2+in\pi}$ for $n = 0,1$; $\ln r + i\theta + 2n\pi i$ for any integer $n$

(b) $i,\ -2,\ -3$

3(a) $\left| \dfrac{Al + Bm + Cn\ -\ D}{\sqrt{A^2 + B^2 + C^2}} \right|$ (b) 2

4 $\lambda = 1, 1, -1$ e-vectors $\begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$ (eigenvectors are not unique)

5 (b) $2\ \dfrac{\sinh kx_1}{k}$ (c) (i) $\dfrac{d^2y}{dx^2} = k$ (ii) $y = k\dfrac{x^2}{2}$

6 $\sin t$ for $0 \le t \le \pi$ , 0 otherwise

7 (a) $f(t) = \dfrac{1}{\pi} + \dfrac{1}{2}\cos t + \dfrac{2}{\pi}\sum_{m=1}^{\infty} (-1)^{m+1} \dfrac{\cos(2mt)}{4m^2 - 1}$ (b) $\dfrac{2}{35\pi}$

8 £ 0.4

9 (a) $F(s)G(s)$ (b) $\dfrac{t}{2} - \dfrac{1}{4} + \dfrac{1}{4}e^{-2t}$ (d) $y = 0,\ \dot{y} = 0,\ \ddot{y} = 1$ at $t = 0$

10 (a) $\dfrac{3}{\sqrt{5}}$ (b) $y = \dfrac{1}{2}x$