9	10.5	9.6	15.7	41°	37°	102°
10	21.7	36.0	36.2	35°	72°	73°
11	7.6	3.4	9.4	49°	20°	111°
12	7.2	15.2	14.3	28°	83°	69°
13	9.1	12.5	15.8	35°	52°	93°
14	14.9	11.2	16.2	63°	42°	75°
15	2.0	0.7	2.5	38°	13°	129°
16	7.6	3.7	9.0	56°	24°	100°
17	18.5	9.8	24.1	45°	22°	113°
18	20.7	16.3	13.6	87°	52°	41°
19	14.6	22.4	29.9	28°	46°	106°
20	7.0	6.6	9.9	45°	42°	93°
21	21.8	20.8	23.8	58°	54°	68°
22	1.1	1.7	1.3	41°	89°	50°
23	1.2	1.2	0.4	85°	76°	19°
24	23.7	27.2	29.7	49°	60°	71°
25	3.4	4.6	5.2	40°	60°	80°

EXERCISE 9.5.5

1. (a) 10.14 km (b) 121°T **2.** 7° 33' **3.** 4.12 cm **4.** 57.32 m **5.** 315.5 m **6.** (a) 124.3 km (b) W28° 47' S

EXERCISE 9.5.6

1. 39.60m 52.84m **2.** 30.2m **3.** 54°,42°, 84° **4.** 37° **5.** 028°T. **6.** 108.1cm **7.** (i) 135° (ii) 136cm **8.** 41°, 56°, 83° **9.** (i) 158° left (ii) 43.22km **10.** 264m **11.** 53.33cm **12.** 186m **13.** 50.12cm **14.** 5.17cm **15.** i. 5950m ii. 13340m iii. 160° iv. 243° **17.** (a) 20.70° (b) 2.578 m (c) 1.995 m^3 **18.** (a) 4243 m^2 (b) 86 m (c) 101 m

EXERCISE 9.6

1. 5.36 cm **2.** 12.3 m **3.** 24 m **4.** 40.3 m, 48.2° **5.** 16.5 min, 8.9° **6.** ~10:49 am

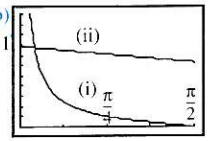
7. (a) i. $\frac{d\sin\phi}{\sin(\phi-\theta)}$ ii. $\frac{d\sin\theta}{\sin(\phi-\theta)}$ (b) $\frac{d\sin\phi\tan\alpha}{\sin(\phi-\theta)}$ or $\frac{d\sin\theta\tan\beta}{\sin(\phi-\theta)}$ (c) $d\left(\frac{\sin\phi\cos\theta}{\sin(\phi-\theta)}-1\right)$

EXERCISE 9.7

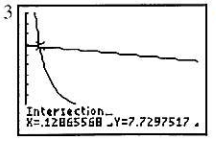
1. (i) $\frac{169\pi}{150}$cm², $5.2+\frac{13\pi}{15}$cm (ii) $\frac{529\pi}{32}$cm², $23+\frac{23\pi}{8}$cm (iii) 242πcm², $88+11\pi$cm (iv) $\frac{1156\pi}{75}$m², $13.6+\frac{68\pi}{15}$m (v) $\frac{96\pi}{625}$cm², $1.28+\frac{12\pi}{25}$cm (vi) $\frac{361\pi}{15}$cm², $15.2+\frac{19\pi}{3}$cm (vii) 5248.8πm², $648+32.4\pi$cm (viii) $\frac{12943\pi}{300}$cm², $17.2+\frac{301\pi}{30}$cm (ix) $\frac{1922\pi}{75}$cm², $12.4+\frac{124\pi}{15}$cm (x) $\frac{15884\pi}{3}$cm², $152+\frac{418\pi}{3}$cm (xi) 12πcm², $24+2\pi$cm (xii) $\frac{98\pi}{3}$cm², $28+\frac{14\pi}{3}$cm (xiii) $\frac{196\pi}{75}$cm², $5.6+\frac{28\pi}{15}$cm (xiv) $\frac{11532\pi}{25}$cm², $49.6+\frac{186\pi}{5}$cm (xv) $\frac{3\pi}{50}$cm², $2.4+\frac{\pi}{10}$cm **2.** 0.63^c, 36° **3.** 0.0942m^3 **4.** 1.64^c **5.** 79cm. **6.** 5.25cm^2 **7.** (a) 31.83m (b) 406.28m (c) 11° **8.** 1.11^c **9.** 0.75^c **10.** (a) 1.85^c (b) i. 37.09 cm ii. 88.57 cm (c) 370.92cm^2 **11.** 26.57 cm^2 **12.** 193.5 cm **13.** (a) 105.22 cm (b) 118.83 cm **14.** (a) 9 cm

(b) 12 cm (c) 36°52'

15 (b)



(c) 0.13



16. 1439.16 cm^2

EXERCISE 10.1

1. (a) 120° (b) 108° (c) 216° (d) 50° **2.** (a) π^c (b) $\frac{3\pi^c}{2}$ (c) $\frac{7\pi^c}{9}$ (d) $\frac{16\pi^c}{9}$ **3.** (a) $\frac{\sqrt{3}}{2}$ (b) $-\frac{1}{2}$ (c) $-\sqrt{3}$ (d) $-\frac{1}{2}$ (e) $-\frac{\sqrt{3}}{2}$ (f) $\frac{1}{\sqrt{3}}$ (g) $-\frac{1}{\sqrt{2}}$ (h) $-\frac{1}{\sqrt{2}}$ (i) 1 (j) $-\frac{1}{\sqrt{2}}$ (k) $\frac{1}{\sqrt{2}}$ (l) –1 (m) 0 (n) 1 (o) 0

4. (a) 0 (b) –1 (c) 0 (d) $\frac{1}{\sqrt{2}}$ (e) $-\frac{1}{\sqrt{2}}$ (f) –1 (g) $-\frac{1}{2}$ (h) $-\frac{\sqrt{3}}{2}$ (i) $\frac{1}{\sqrt{3}}$ (j) $-\frac{\sqrt{3}}{2}$ (k) $\frac{1}{2}$ (l) $-\sqrt{3}$ (m) $-\frac{1}{\sqrt{2}}$ (n) $\frac{1}{\sqrt{2}}$ (o) –1 **5.** (a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) $\frac{1}{2}$ **6.** (a) $-\frac{1}{2}$ (b) $-\frac{1}{\sqrt{2}}$ (c) $\sqrt{3}$ (d) $\frac{1}{2}$ (e) $-\frac{\sqrt{3}}{2}$ (f) $\frac{1}{\sqrt{3}}$ (g) $-\frac{\sqrt{3}}{2}$ **7.** (a) $\left(\frac{1}{2},\frac{\sqrt{3}}{2}\right)$ (b) $\left(-\frac{1}{2},\frac{\sqrt{3}}{2}\right)$ (c) $\left(-\frac{1}{\sqrt{2}},-\frac{1}{\sqrt{2}}\right)$ (d) $\left(\frac{\sqrt{3}}{2},-\frac{1}{2}\right)$ **8.** (a) 0 (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1+\sqrt{3}}{2\sqrt{2}}$ **10.** (a) $-\frac{2}{3}$ (b) $-\frac{2}{3}$ (c) $-\frac{2}{3}$ **11.** (a) $-\frac{2}{5}$ (b) $\frac{2}{5}$ **12.** (a) k (b) $-\frac{1}{k}$ (c) $-k$ **13.** (a) $\frac{\sqrt{5}}{3}$ (b) $-\frac{\sqrt{5}}{3}$ **14.** (a) $-\frac{3}{5}$ (b) $\frac{3}{4}$ (c) $\frac{4}{5}$ **15.** (a) $\frac{4}{5}$ (b) $\frac{3}{4}$ **16.** (a) $-k$ (b) $-\sqrt{1-k^2}$ **17.** (a) $-\sqrt{1-k^2}$ (b) $\frac{k}{\sqrt{1-k^2}}$ **18.** (a) $\sin\theta$ (b) $\cot\theta$ (c) 1 **19.** (a) $\frac{\pi}{3},\frac{2\pi}{3}$ (b) $\frac{\pi}{3},\frac{5\pi}{3}$ (c) $\frac{\pi}{3},\frac{4\pi}{3}$ (d) $\frac{5\pi}{6},\frac{7\pi}{6}$ (e) $\frac{5\pi}{6},\frac{11\pi}{6}$ (f) $\frac{7\pi}{6},\frac{11\pi}{6}$

EXERCISE 10.2.1

3. (a) $x^2+y^2=k^2, -k\le x\le k$ (b) $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1, -b\le x\le b$ (c) $(x-1)^2+(2-y)^2=1, 1\le x\le 2$ (d) $\frac{(1-x)^2}{b^2}+\frac{(y-2)^2}{a^2}=1$ (e) $5x^2+5y^2+6xy=16$ **5.** (a) $\frac{\pi}{3},\frac{2\pi}{3},\frac{4\pi}{3},\frac{5\pi}{3}$ (b) $\frac{\pi}{2},\frac{7\pi}{6},\frac{11\pi}{6}$ (c) $0,\frac{\pi}{6},\frac{5\pi}{6},\pi,2\pi$ (d) $\frac{\pi}{2},\frac{3\pi}{2}$ **9.** (a) $\frac{2a}{a^2+1}$ (b) $\frac{a^2-1}{a^2+1}$ **10.** (a) 1 (b) 1 (c) 1 **11.** (a) $\frac{1-\sqrt{x^2-1}}{x}$ (b) $\frac{1+\sqrt{x^2-1}}{x}$ (c) $\frac{2}{x^2}-1$ **12.** (a) $5\le\cos^2\theta+5\le 6$ (b) $1\le\frac{5}{3\sin^2\theta+2}\le\frac{5}{2}$ (c) $-2\le 2\cos^2\theta+\sin\theta-1\le 1$ **13.** (a) ± 2 (b) $\frac{\pi}{6}+2k\pi, k\in\mathbb{Z}$ or $\frac{7\pi}{6}+2k\pi, k\in\mathbb{Z}$ **14.** (a) $5^{-4}\le 5^{3\sin\theta-1}\le 25$ (b) $3^{-1}\le 3^{1-2\cos\theta}\le 27$ **15.** (a) $1+2k$ (b) $(1-k)\sqrt{1+2k}$ **16.** (a) $\frac{1-a}{2\sqrt{a}}$ (b) i. $2+\sqrt{2a-a^2}$ ii. $\frac{-\sqrt{2a-a^2}}{1-a}$ **17.** (a) $\frac{2}{3}$ (b) $0,\pm\frac{2\sqrt{2}}{3}$ **18.** $0,\frac{\pi}{3},\frac{2\pi}{3},\pi$

10. (a) ii. $\left[0, \frac{\pi}{4}\right) \cup \left(\frac{5\pi}{4}, 2\pi\right]$ (b) ii. $\left[0, \frac{\pi}{6}\right) \cup \left(\frac{\pi}{2}, \frac{5\pi}{6}\right) \cup \left(\frac{3\pi}{2}, 2\pi\right]$ **11.** (a) 90°,199°28',340°32'

(b) (199°28',340°32') **24.** $\left\{(x, y) | x = 2k\pi + \frac{\pi}{2}, y = 2k\pi\right\} \cup \left\{(x, y) | x = 2k\pi - \frac{\pi}{2}, y = 2k\pi + \pi\right\}, k \in \mathbb{Z}$

EXERCISE 10.5

1. i. 5, 24, 3, 19 ii. $T = 5\sin\left(\frac{\pi t}{12} - 3\right) + 19$ iii. 23.6° **2.** i. 3, 4.2, 3, 7

ii. $L = 3\sin\left(\frac{\pi t}{2.1} - 3\right) + 7$ **3.** i. 5, 11, 0, 7 ii. $V = 5\sin\left(\frac{2\pi t}{11}\right) + 7$ **4.** i. 1, 11, 1, 12

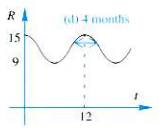
ii. $P = \sin\left(\frac{2\pi t}{11} - 1\right) + 12$ **5.** i. 2.7, 7, 2, 6 ii. $S = 2.7\sin\left(\frac{2\pi t}{7} - 2\right) + 6$ **6.** i. 0.6, 3.5, 0, 11

ii. $P = 0.6\sin\left(\frac{4\pi t}{7}\right) + 11$ **7.** i. 0.8, 4.7, 5, 11 ii. $D = 0.8\sin\left(\frac{2\pi t}{4.7} - 3.5\right) + 11$ **8.** (a) 3000

(b) 1000, 5000 (c) $\frac{4}{9}$ **9.** (a) 6.5 m, 7.5 m (b) 1.58 sec, 3.42 sec **10.** (a) 750, 1850 (b) 3.44

(c) Mid-April to End of August

11. (a) 15000 (b) 12 months (c) (d) 4 months

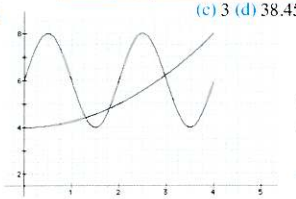


12. (a) π,–2,2 (b) $\frac{1}{3}$ m (c) $\frac{4}{3}$ m

13.(a)

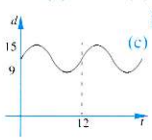
t	0	0.5	1	1.5	2	2.5	3	3.5	4
$F(t)$	6	8	6	4	6	8	6	4	6
$G(t)$	4	4.0625	4.25	4.5625	5	5.5625	6.25	7.0625	8

(b)



(c) 3 (d) 38.45%

14. (a)



(b) i. 7,11,17,23

ii. [0, 7] ∪ [11, 17] ∪ [23, 24]

(c) 14.9m

EXERCISE 11.1.1

1. (i) $\begin{bmatrix} 2 & 8 \\ -2 & 16 \end{bmatrix}$ (ii) $\begin{bmatrix} -2 & 3 \\ 1 & -5 \end{bmatrix}$ (iii) $\begin{bmatrix} 6 & -9 \\ -3 & 15 \end{bmatrix}$ (iv) $\begin{bmatrix} 4 & 5 \\ -3 & 21 \end{bmatrix}$ (v) $\begin{bmatrix} 7 & 6 \\ -5 & 34 \end{bmatrix}$ (vi) $\begin{bmatrix} -2 & -19 \\ 3 & -27 \end{bmatrix}$

2. (i) $\begin{bmatrix} -1 & -1 & -2 \\ 0 & 6 & -9 \end{bmatrix}$ (ii) $\begin{bmatrix} -2 & -2 & -4 \\ 0 & 12 & -18 \end{bmatrix}$ (iii) $\begin{bmatrix} -2 & -5 \\ 2 & 2 \\ 3 & 1 \end{bmatrix}$ (iv) $\begin{bmatrix} 2 & 0 \\ 4 & 2 \\ 0 & -2 \end{bmatrix}$ (v) $\begin{bmatrix} 5 & 5 \\ 4 & 1 \\ -3 & -4 \end{bmatrix}$ (vi) $\begin{bmatrix} -6 & -15 \\ 6 & 6 \\ 9 & 3 \end{bmatrix}$

3. (i) $\begin{bmatrix} 3 & 3 & 6 \\ 0 & 3 & 12 \\ 0 & 6 & 3 \end{bmatrix}$ (ii) $\begin{bmatrix} -2 & -4 & 6 \\ 4 & 0 & 2 \\ 4 & 0 & -8 \end{bmatrix}$ (iii) $\begin{bmatrix} 0 & -1 & 5 \\ 2 & 1 & 5 \\ 2 & 2 & -3 \end{bmatrix}$ (iv) $\begin{bmatrix} 2 & 3 & -1 \\ -2 & 1 & 3 \\ -2 & 2 & 5 \end{bmatrix}$ (v) $\begin{bmatrix} 1 & -1 & 12 \\ 4 & 3 & 14 \\ 4 & 6 & -5 \end{bmatrix}$ (vi) $\begin{bmatrix} -3 & -5 & 4 \\ 4 & -1 & -2 \\ 4 & -2 & -9 \end{bmatrix}$

4. (i) 23 (ii) Nuts (iii) Taps (iv) Week 2 Wednesday - = B3 + I3, = B4 +I4 **5.** 7 by 5 **6.** $\begin{bmatrix} 3a & 3 \\ 0 & 0 \end{bmatrix}$

7. 3 **8.** 2 **9.** (a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} -\cos 2\theta & 0 \\ 0 & \cos 2\theta \end{bmatrix}$ (c) $\begin{bmatrix} -\cos 2\theta & 0 \\ 0 & \cos 2\theta \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ **10.** (a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} -\cos 2\theta & 2\sin\theta \\ -2\cos\theta & \cos 2\theta \end{bmatrix}$ **11.** $a = 3, b = 4$ **12.** $x = 1$

EXERCISE 11.1.2

1. (i) $\begin{bmatrix} 5 & -4 \\ 2 & -1 \end{bmatrix}$ (ii) $\begin{bmatrix} 6 & -8 \\ -15 & 26 \end{bmatrix}$ (iii) $\begin{bmatrix} -7 & 17 \\ 3 & 3 \end{bmatrix}$ (iv) $\begin{bmatrix} -15 & -10 \\ -10 & -36 \end{bmatrix}$ (v) $\begin{bmatrix} \frac{19}{6} & \frac{89}{3} \\ -\frac{1}{8} & \frac{11}{2} \end{bmatrix}$ (vi) $\begin{bmatrix} 2.6 & 5.5 \\ -8.55 & 0 \end{bmatrix}$

(vii) $\begin{bmatrix} 12 & -4 & 2 \\ 6 & 0 & -3 \end{bmatrix}$ (viii) $\begin{bmatrix} -9 & 3 & 2 \\ 4 & -2 & -2 \end{bmatrix}$ (ix) $\begin{bmatrix} \frac{7}{6} & \frac{3}{2} & \frac{7}{3} \\ \frac{13}{3} & 5 & \frac{29}{3} \end{bmatrix}$ (x) $\begin{bmatrix} 1.6 & -0.7 & 3.8 \\ -3.9 & -4.2 & -5.7 \end{bmatrix}$ (xi) $\begin{bmatrix} 11 & -2 \\ 11 & 3 \\ 1 & -7 \end{bmatrix}$

(xii) $\begin{bmatrix} 7 & 5 \\ 21 & -26 \\ 6 & 4 \end{bmatrix}$ (xiii) $\begin{bmatrix} 12 & 6 & 2 \\ 12 & 1 & 4 \\ 21 & 3 & 6 \end{bmatrix}$ (xiv) $\begin{bmatrix} -5 & 6 & 1 \\ 4 & -4 & -12 \\ -1 & 4 & 2 \end{bmatrix}$ (xv) $\begin{bmatrix} -7 & 2 & 13 \\ 8 & -8 & -17 \\ -4 & -11 & 4 \end{bmatrix}$ (xvi) $\begin{bmatrix} -\frac{25}{2} & -\frac{50}{3} & 4 \\ -\frac{79}{4} & -\frac{83}{6} & \frac{27}{4} \\ -2 & \frac{11}{6} & \frac{3}{4} \end{bmatrix}$

(xvii) $\begin{bmatrix} x + 3x^2 & -x^2 + 1 \\ 2x + 5x^2 & -x^2 + 2 \\ -x^2 + 5x & -2x \end{bmatrix}$ (xviii) $\begin{bmatrix} a + 2x^2 - a^2 & 2a + 4x & -2x^2 + 2a \\ a - 2ax & -2a & 3a + 2ax \\ 0 & 2a & -ax - x \end{bmatrix}$

2. (i) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (ii) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ (iii) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ if n is odd and $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if n is even.