

Chapter 12

Exercise 12A

- 1 a 18
 b 8
 c 0
 d 13.2
 e 13.3333
 f -114
- 2 a 135
 b -28.5
 c -11.25
 d 104
 e 18
- 3 a 2.667
 b 0.0121528
 c -1.3125
 d 38
 e 4
 f 24.0732
 g 4
 h 968
 i 0.1759
- 4 a 0.4
 b 121.3333
 c 130
 d -60.6667
 e -12.75
 f 2.375
- 5 a 2.6667
 b 23.3333
 c 0.06944
 d 12.6667
 e -27.9414
 f 7.5
 g 13.77778

- h 0.27006
 i 0.75

6
$$\int_8^{18} \frac{1}{4} \sqrt{x} \, dx$$

$$\left[\frac{x^{\frac{3}{2}}}{\frac{3}{2} \cdot \frac{1}{4}} \right]_8^{18}$$

$$\left(\frac{18^{\frac{3}{2}}}{\frac{3}{2}} \right) - \left(\frac{8^{\frac{3}{2}}}{\frac{3}{2}} \right)$$

$$\left(\frac{(2 \times 9)^{\frac{3}{2}}}{\frac{3}{2}} \right) - \left(\frac{(2 \times 4)^{\frac{3}{2}}}{\frac{3}{2}} \right)$$

$$\left(\frac{27(2)^{\frac{3}{2}}}{\frac{3}{2}} \right) - \left(\frac{8(2)^{\frac{3}{2}}}{\frac{3}{2}} \right)$$

$$2\sqrt{2} \left(\frac{27}{6} - \frac{8}{6} \right)$$

$$\frac{19\sqrt{2}}{3}$$

- 7 $k = 0.5$
 $k = 1$
- 8 a $p^3 - 2p^2 - ((-2)^3 - 2(-2)^2) - 48$
 $= p^3 - 2p^2 - 32$
- b i $(4)^3 - 2(4)^2 - 32 = 0$
 ii $(p - 4)(p^2 + 2p + 8) = 0$
 Second product has no roots, first product gives $p=4$.
- 9 -7
- 10 $t = 2$
 $t = -7$

Exercise 12B

- 1 a 1
 b $\frac{5}{2}$
 c 4
 d $\frac{3\sqrt{3}}{4}$
 e $\frac{1}{3}$
 f $\sqrt{3} - 1$

2 a $\frac{3}{2}$

b $3\sqrt{2}$

c 4

d $\frac{3\sqrt{3}}{4}$

e $\frac{1}{3}$

f $\sqrt{3} - 1$

3 a $-3\sqrt{2}(1 + \sqrt{2})$

b 0

c $\sqrt{2}$

d $\frac{-2(2+\sqrt{2})}{3}$

e 0

f 0

4 a 0.51

b 4.75

c 0.38

d 0.62

e 6.90

f 7.65

5 $t = \frac{\pi}{4}$

$t = \frac{3\pi}{4}$

6 $p = \frac{\pi}{6}$

$p = \frac{5\pi}{6}$

7 $\frac{7\pi}{6}$

8 a

$$\cos 2x = \cos(x + x) = (\cos x)^2 - (\sin x)^2$$

$$= 1 - 2(\sin x)^2$$

$$\Rightarrow (\sin x)^2 = \frac{1}{2}(1 - \cos 2x)$$

$$\begin{aligned} \text{b} \quad \int_{\frac{\pi}{4}}^{\frac{\pi}{3}} \frac{1}{2}(1 - \cos 2x) dx &= \left[\frac{x}{2} - \frac{1}{4} \sin 2x \right]_{\frac{\pi}{4}}^{\frac{\pi}{3}} \\ &= \left(\frac{\pi}{2} - \frac{1}{4} \sin \left(\frac{2\pi}{3} \right) \right) - \left(\frac{\pi}{4} - \frac{1}{4} \sin \left(\frac{2\pi}{4} \right) \right) \\ &= \frac{1}{24}(\pi + 6 - 3\sqrt{3}) \end{aligned}$$

$$\begin{aligned} \text{9 a} \quad \cos \frac{\pi}{4} \cos \frac{\pi}{6} + \sin \frac{\pi}{4} \sin \frac{\pi}{6} &= \\ \frac{1}{\sqrt{2}} \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \frac{1}{2} &= \frac{1}{2\sqrt{2}}(\sqrt{3} + 1) \end{aligned}$$

$$\begin{aligned} \text{b} \quad \sin \frac{\pi}{4} \cos \frac{\pi}{6} - \cos \frac{\pi}{4} \sin \frac{\pi}{6} &= \\ \frac{1}{\sqrt{2}} \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \frac{1}{2} &= \frac{1}{2\sqrt{2}}(\sqrt{3} - 1) \end{aligned}$$

$$\begin{aligned} \text{c} \quad \int_{-\frac{\pi}{12}}^{\frac{\pi}{12}} \cos x - \sin x dx &= \\ [\cos x + \sin x]_{-\frac{\pi}{12}}^{\frac{\pi}{12}} &= \\ \cos \frac{\pi}{12} + \sin \frac{\pi}{12} - \left(\cos \left(-\frac{\pi}{12} \right) \right. \\ &\quad \left. + \sin \left(-\frac{\pi}{12} \right) \right) = \\ \frac{1}{\sqrt{2}}(\sqrt{3} - 1) &= \\ \frac{1}{2}(\sqrt{6} - \sqrt{2}) \end{aligned}$$