

EXERCISE 18C

3a $\sin \frac{\pi}{6} = \frac{1}{2}$

b -1

c $\sqrt{3}$

d 0

4a $\frac{3}{2}\pi, \frac{\pi}{2}$

b. $\frac{13}{6}\pi, \frac{\pi}{6}$

c. $\frac{\pi}{6}$

d 0

5a $\sin \frac{\pi}{6} = \frac{1}{2}$

b $\frac{1}{2}$

c $\cos(-\frac{\pi}{6}) = \frac{1}{2}\sqrt{3}$

d $\tan \frac{\pi}{4} = 1$

EXERCISE 18D

1 two smallest \oplus values of θ , in radians, 2 dp 1 bdhglo

b $\sin \theta = -0.86$

l $\tan(\frac{\pi}{2} - \theta) = -4$

① $\theta = -59.3 \pm k 360 = 300.7^\circ$

$\theta = -1.0 \pm k.2\pi = 5.25 \text{ rad}$

② $\theta = (\pi + 1.0) \pm k 2\pi \text{ rad}$

$= 4.18 \text{ rad}$

$\therefore \theta = 4.18, 5.25$

$\frac{\pi}{2} - \theta = -1.33 \pm k\pi$

$\theta = \frac{\pi}{2} + 1.33 \pm k\pi$

$= 2.90 \pm k\pi$

$= 2.90, 6.04$

d $\cos \theta = 0.81$

o $\cos(3\theta - \frac{2}{3}\pi) = 0$

① $3\theta - \frac{2}{3}\pi = \frac{\pi}{2} \pm k.2\pi$

$3\theta = \frac{7}{6}\pi \pm k.2\pi \div 3$

$\theta = \frac{7}{18}\pi \pm \frac{2}{3}\pi k$

$= \frac{7}{18}\pi, \frac{19}{18}\pi$

① $\theta = 0.63$

② $\theta = -0.63 \pm k 2\pi \text{ rad}$

$= 5.66 \text{ rad}$

$\therefore \theta = 0.63, 5.66 \text{ rad}$

② $3\theta - \frac{2}{3}\pi = -\frac{\pi}{2} \pm k.2\pi$

$3\theta = \frac{\pi}{6} \pm k.2\pi$

$\theta = \frac{\pi}{18} \pm k. \frac{2\pi}{3}$

$= \frac{\pi}{18}, \frac{13}{18}\pi$

h $\tan \theta = -0.35$

$\theta = -0.34 \pm k.\pi$

$\theta = 2.8, 5.95 \text{ rad}$

j $\sin(\pi + \theta) = 0.3$

$\therefore \theta = \frac{\pi}{18}, \frac{7}{18}\pi = 0.17, 1.22$

① $\pi + \theta = 0.30 \pm k.2\pi$

$\theta = (0.3 - \pi) \pm k.2\pi$

$= 3.45 \text{ rad}$

② $\pi + \theta = (\pi - 0.30) \pm k.2\pi$

$\theta = -0.30 \pm k.2\pi$

$= 5.98 \text{ rad}$

$\therefore \theta = 3.45, 5.98 \text{ rad}$

$$2 \quad -\pi \leq \theta \leq \pi, \text{ 2 dp}$$

$$g \quad 4 \sin \theta = 3 \cos \theta \quad \div \cos \theta$$

$$4 \tan \theta = 3$$

$$\tan \theta = \frac{3}{4}$$

$$\theta = 0.64 \pm k \cdot \pi$$

$$= -2.50, 0.64 //$$

$$h \quad 3 \sin^2 \theta = 1$$

$$\sin^2 \theta = \frac{1}{3}$$

$$\sin \theta = \pm \sqrt{\frac{1}{3}}$$

$$\sin \theta = \sqrt{\frac{1}{3}} :$$

$$\theta = 0.62, 2.53$$

$$\sin \theta = -\sqrt{\frac{1}{3}} :$$

$$\theta = -0.62, -2.53$$

$$\therefore \theta = \pm 0.62, \pm 2.53$$

$$i \quad 3 \sin \theta = \tan \theta$$

$$3 \sin \theta - \frac{\sin \theta}{\cos \theta} = 0$$

$$\sin \theta \cdot \left(3 - \frac{1}{\cos \theta} \right) = 0$$

$$\sin \theta = 0 \quad \text{or} \quad 3 - \frac{1}{\cos \theta} = 0$$

$$\theta = 0, \pi, -\pi \quad 3 = \frac{1}{\cos \theta}$$

$$\cos \theta = \frac{1}{3}$$

$$\theta = \pm 1.23 \pm k \cdot 2\pi$$

$$\therefore \theta = 0, \pm 1.23, \pm \pi$$

$$3d \quad \cos 4x = -\frac{1}{5} \quad 0 < x \leq 2\pi$$

$$\textcircled{1} \quad 4x = 1.77 \pm k \cdot 2\pi$$

$$x = 0.44 \pm \frac{\pi}{2} k$$

$$= 0.44, 2.01, 3.58, 5.16$$

$$\textcircled{2} \quad 4x = -1.77 \pm k \cdot 2\pi$$

$$x = -0.44 \pm \frac{\pi}{2} k$$

$$= 1.13, 2.70, 4.27, 5.84$$

$$\therefore x = 0.44, 1.13, 2.01, 2.70, 3.58, 4.27, 5.16, 5.84 //$$

$$3f. \quad \sin 3x = -0.45$$

$$\textcircled{1} \quad 3x = -0.47 \pm k \cdot 2\pi$$

$$x = -0.16 \pm k \cdot \frac{2}{3}\pi$$

$$= 1.94, 4.03, 6.13$$

$$\textcircled{2} \quad 3x = \pi + 0.47 \pm k \cdot 2\pi$$

$$x = 1.2 \pm k \cdot \frac{2}{3}\pi$$

$$= 1.2, 3.30, 5.39 \text{ rad}$$

$$\therefore x = 1.2, 1.94, 3.30, 4.03, 5.39, 6.13$$

$$3e. \quad \tan 2x = 0.5$$

$$2x = 0.46 \pm k \cdot \pi$$

$$x = 0.23 \pm k \cdot \frac{\pi}{2}$$

$$= 0.23, 1.80, 3.37, 4.94 \text{ rad}$$

$$4d. \quad \cos 2t = 0.264$$

$$2t = 1.30 \pm k \cdot 2\pi$$

$$t = 0.65 \pm k \cdot \pi$$

$$= -2.49, 0.65$$

$$2t = -1.30 \pm k \cdot 2\pi$$

$$t = -0.65 \pm k \cdot \pi$$

$$= -0.65, 2.49$$

$$\therefore t = \pm 2.49, \pm 0.65$$

$$4e \quad \tan 5t = 0.7, \quad -\pi < t \leq \pi$$

$$5t = 0.61 \pm k \cdot \pi$$

$$t = 0.12 \pm \frac{\pi}{5} k$$

$$t = -0.51, -1.13, -1.76, -2.39, -3.02,$$

$$0.12, 0.75, 1.38, 2.01, 2.64$$

$$4f. \quad \sin 2t = -0.42$$

$$\textcircled{1} \quad 2t = -0.43 \pm k \cdot 2\pi$$

$$t = -0.22 \pm k \cdot \pi$$

$$\textcircled{2} \quad 2t = 3.58 \pm k \cdot 2\pi$$

$$t = 1.79 \pm k \cdot \pi$$

$$\therefore t = -1.36, -0.22, 1.79, 2.92 //$$

5. $-\pi < \theta \leq \pi$

d. $\cos \frac{1}{3}\theta = \frac{1}{2}$

① $\frac{1}{3}\theta = \frac{\pi}{3} \pm k \cdot 2\pi$

$\theta = \pi \pm k \cdot 6\pi$

② $\frac{1}{3}\theta = -\frac{\pi}{3} \pm k \cdot 2\pi$

$\theta = -\pi \pm k \cdot 6\pi$

$\therefore \theta = \pi, -\pi$

e. $\tan \frac{2}{3}\theta = 0.5$

$\frac{2}{3}\theta = 0.46 \pm k \cdot \pi$

$\theta = 0.70 \pm k \cdot \frac{3}{2}\pi$

$\therefore \theta = 0.70$

5f. $\sin \frac{2}{5}\theta = -0.4$

① $\frac{2}{5}\theta = -0.41 \pm 2\pi k$

$\theta = -1.03 \pm 5\pi k$

$= -1.03$

② $\frac{2}{5}\theta = \pi + 0.41 \pm 2\pi k$

$\theta = 8.88 \pm 5\pi k$

$\therefore \theta = -1.03$

6. $0 < \theta \leq 2\pi$

d. $\tan \left(\frac{3}{2}\theta - \frac{1}{6}\pi\right) = -\sqrt{3}$

$\frac{3}{2}\theta - \frac{1}{6}\pi = -\frac{\pi}{3} \pm k\pi$

$\frac{3}{2}\theta = -\frac{\pi}{6} \pm k\pi$

$\theta = -\frac{\pi}{9} \pm \frac{2}{3}\pi k$

$= \frac{5}{9}\pi, \frac{11}{9}\pi, \frac{17}{9}\pi$

e. $\cos \left(2\theta - \frac{5}{18}\pi\right) = -\frac{1}{2}$

① $2\theta - \frac{5}{18}\pi = \frac{2\pi}{3} \pm k \cdot 2\pi$

$2\theta = \frac{17}{18}\pi \pm 2\pi k$

$\theta = \frac{17}{36}\pi \pm \pi k$

$= \frac{17}{36}\pi, \frac{53}{36}\pi$

② $2\theta - \frac{5}{18}\pi = -\frac{2\pi}{3} \pm k \cdot 2\pi$

$2\theta = -\frac{7}{18}\pi \pm k \cdot 2\pi$

$\theta = -\frac{7}{36}\pi \pm k\pi$

$= \frac{29}{36}\pi, \frac{65}{36}\pi$

$\therefore \theta = \frac{17}{36}\pi, \frac{29}{36}\pi, \frac{53}{36}\pi, \frac{65}{36}\pi$

f. $\sin \left(\frac{1}{2}\theta + \frac{5}{18}\pi\right) = 1$

$\frac{1}{2}\theta + \frac{5}{18}\pi = \frac{\pi}{2} \pm k \cdot 2\pi$

$\frac{1}{2}\theta = \frac{2}{9}\pi \pm 2\pi k$

$\theta = \frac{4}{9}\pi \pm 4\pi k$

$= \frac{4}{9}\pi$

g. $\cos \left(\frac{1}{5}\theta - \frac{5}{18}\pi\right) = 0$

① $\frac{1}{5}\theta - \frac{5}{18}\pi = \frac{\pi}{2} \pm k \cdot 2\pi$

$\frac{1}{5}\theta = \frac{7}{9}\pi \pm k \cdot 2\pi$

$\theta = \frac{35}{9}\pi \pm k \cdot 10\pi$

② $\frac{1}{5}\theta - \frac{5}{18}\pi = -\frac{\pi}{2} \pm k \cdot 2\pi$

$\frac{1}{5}\theta = -\frac{2}{9}\pi \pm k \cdot 2\pi$

$\theta = -\frac{10}{9}\pi \pm k \cdot 10\pi$

$\therefore \theta = \text{No roots}$

h. $\tan(3\theta - \pi) = -1$

$3\theta - \pi = -\frac{\pi}{4} \pm k \cdot \pi$

$3\theta = \frac{3\pi}{4} \pm k \cdot \pi$

$\theta = \frac{\pi}{4} \pm k \cdot \frac{\pi}{3}$

$= \frac{\pi}{4}, \frac{7}{12}\pi, \frac{11}{12}\pi, \frac{15}{12}\pi, \frac{19}{12}\pi, \frac{23}{12}\pi$

i. $\sin \left(\frac{1}{4}\theta - \frac{1}{9}\pi\right) = 0$

① $\frac{1}{4}\theta - \frac{1}{9}\pi = 0 \pm k \cdot 2\pi$

$\frac{1}{4}\theta = \frac{\pi}{9} \pm k \cdot 2\pi$

$\theta = \frac{4\pi}{9} \pm k \cdot 8\pi$

② $\frac{1}{4}\theta - \frac{1}{9}\pi = \pi \pm k \cdot 2\pi$

$\frac{1}{4}\theta = \frac{10}{9}\pi \pm k \cdot 2\pi$

$\theta = \frac{40}{9}\pi \pm k \cdot 8\pi$

$\therefore \theta = \frac{4\pi}{9}$