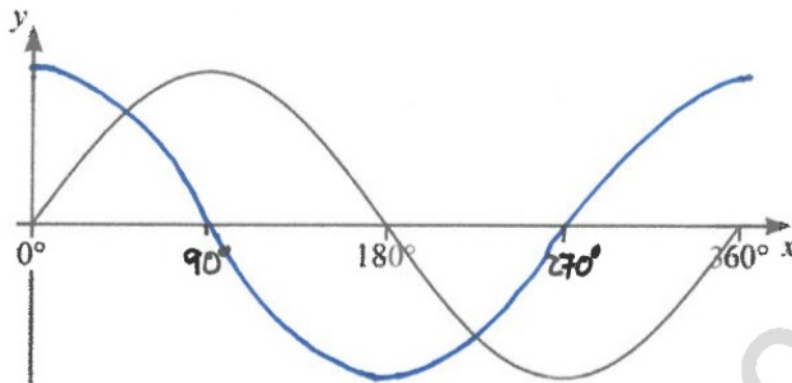


12

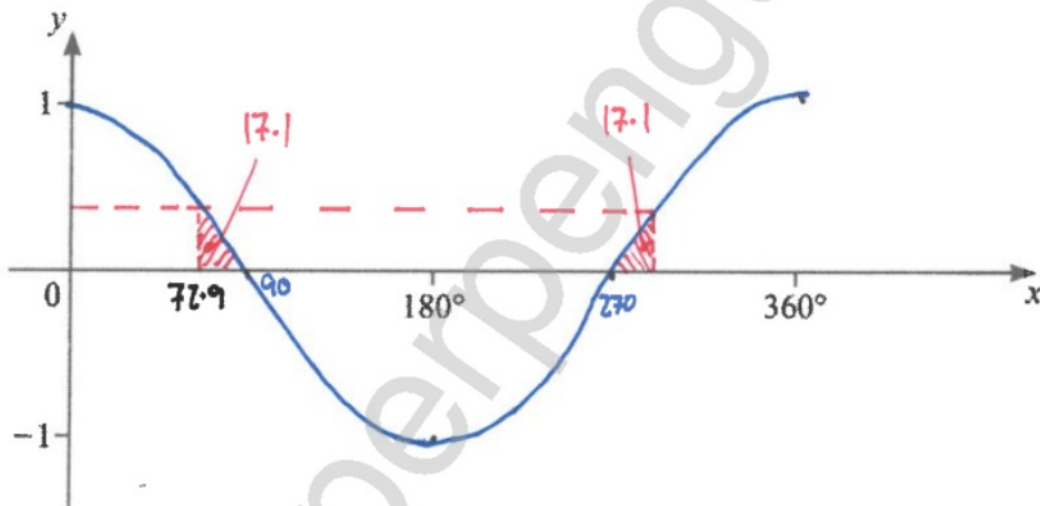


The diagram shows the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.

On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.

[1]

- 23 (a) On the axes, sketch the graph of $y = \cos x$, for $0^\circ \leq x \leq 360^\circ$.



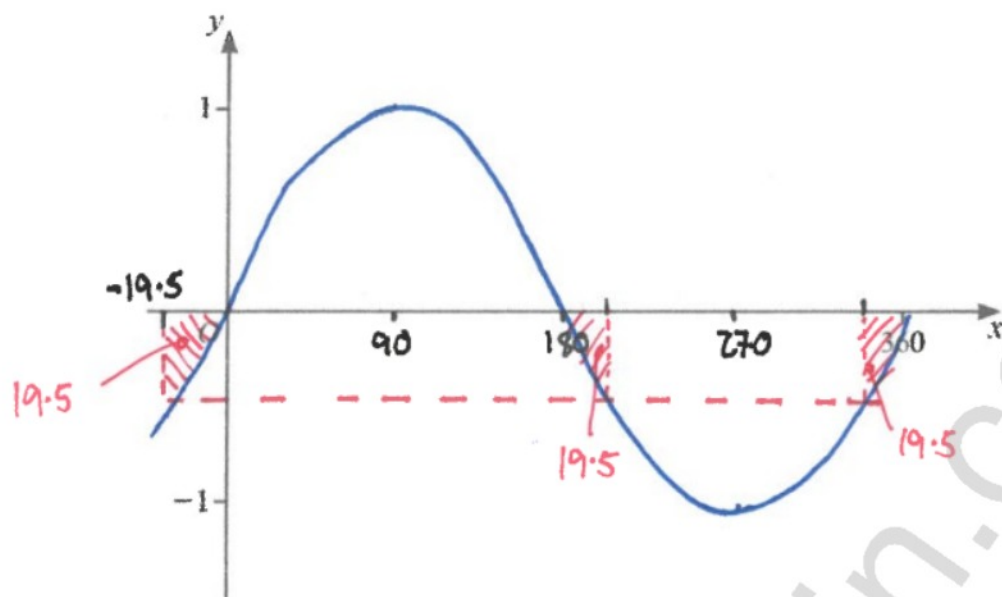
[2]

- (b) Solve the equation $\cos x = 0.294$ for $0^\circ \leq x \leq 360^\circ$.

$$x = \cos^{-1}(0.294) = 72.9^\circ \quad \text{use graph} \quad \rightarrow \quad 270 + 17.1 = 287.1^\circ$$

$$x = 72.9^\circ \text{ or } x = 287.1^\circ \quad [2]$$

- 17 (a) Sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

- (b) Solve the equation $3 \sin x + 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$$3 \sin x + 1 = 0$$

$$3 \sin x = -1$$

$$\div 3 \quad \div 3$$

$$\sin x = -\frac{1}{3}$$

$$x = \sin^{-1}\left(-\frac{1}{3}\right)$$

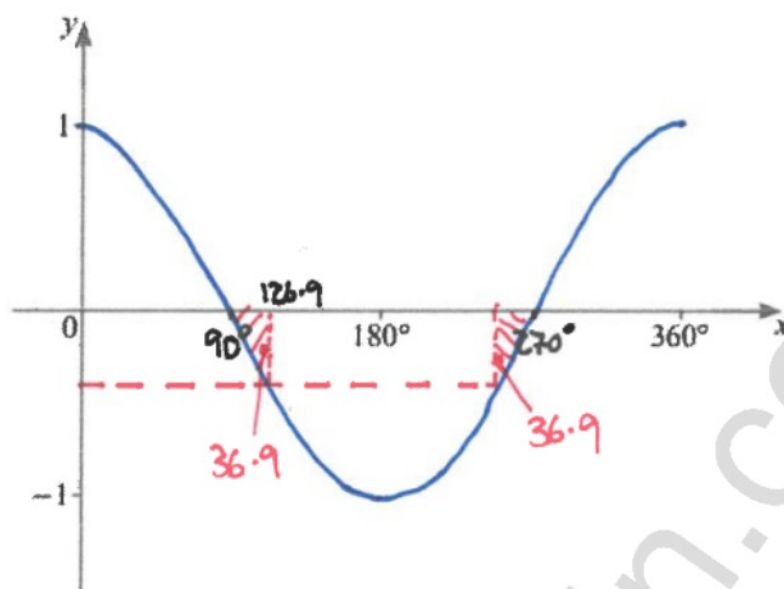
$$= -19.5^\circ \text{ use graph}$$

$$180 + 19.5 = \underline{199.5^\circ}$$

$$360 - 19.5 = \underline{340.5^\circ}$$

$$x = \underline{199.5^\circ} \text{ or } x = \underline{340.5^\circ} \quad [3]$$

- 19 (a) On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

- (b) Solve the equation $5 \cos x + 3 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$$5 \cos x + 3 = 0$$

$$5 \cos x = -3$$

$$\cos x = \frac{-3}{5}$$

$$x = \cos^{-1}\left(\frac{-3}{5}\right)$$

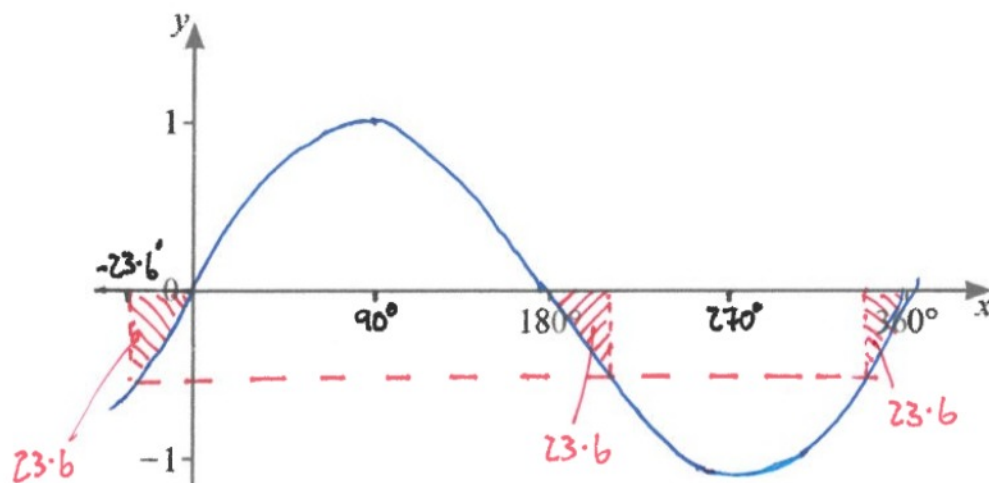
$$= 126.9^\circ$$

use graph

$$270 - 36.9 = 233.1^\circ$$

$$x = 126.9^\circ \text{ or } x = 233.1^\circ \quad [3]$$

(b) (i) On the grid, sketch the curve $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

(ii) Solve the equation $\sin x + 0.4 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$$\sin x + 0.4 = 0$$

$$\sin x = -0.4$$

$$\sin x = -0.4$$

$$x = \sin^{-1}(-0.4)$$

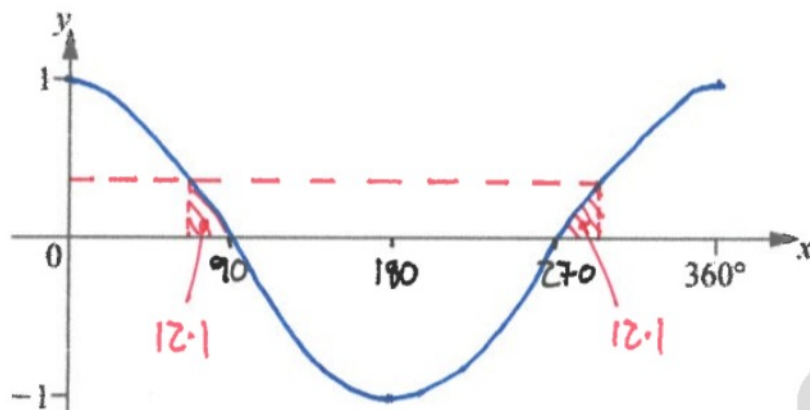
$$= -23.6^\circ \text{ use graph}$$

$$180 + 23.6 = 203.6^\circ$$

$$360 - 23.6 = 336.4^\circ$$

$$x = 203.6^\circ \text{ or } x = 336.4^\circ \quad [3]$$

19 (a)



Sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.

[2]

(b) When $\cos x = 0.21$, find the **reflex** angle x .

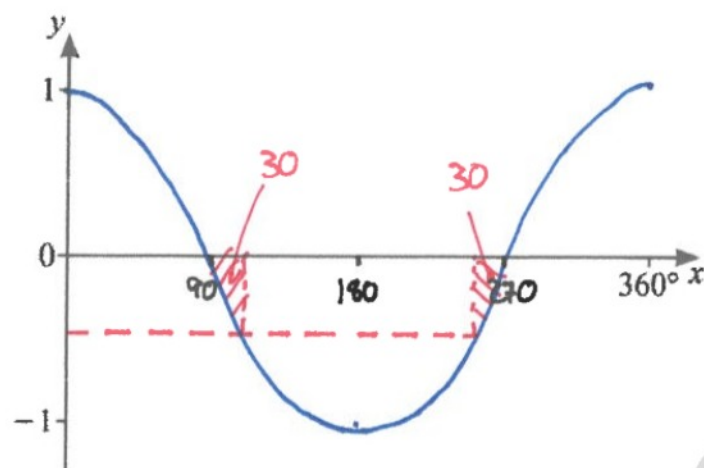
$$x = \cos^{-1}(0.21)$$

$$= 77.9^\circ \text{ use graph}$$

$$270 + 12.1 = 282.1^\circ$$

$$282.1^\circ$$

[2]



(a) On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.

[2]

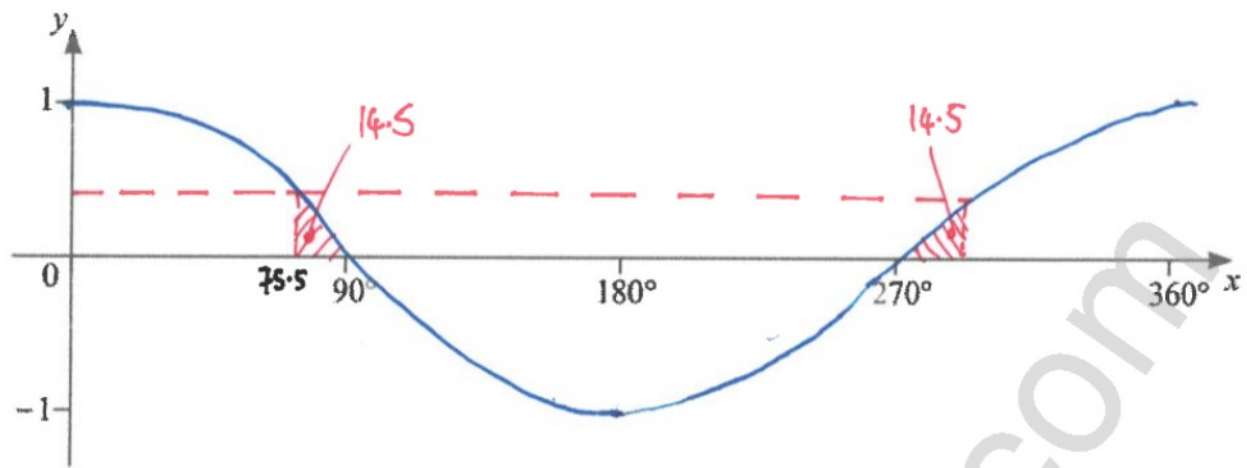
(b) Solve the equation $\cos x = -\frac{1}{2}$ for $0^\circ \leq x \leq 360^\circ$.

$$x = \cos^{-1}\left(-\frac{1}{2}\right)$$

$$= \underline{120^\circ} \text{ use graph}$$

$$270 - 30 = 240^\circ$$

$$x = \underline{120^\circ} \text{ or } x = \underline{240^\circ} \quad [2]$$



(a) On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.

[2]

(b) Solve the equation $4 \cos x + 2 = 3$ for $0^\circ \leq x \leq 360^\circ$.

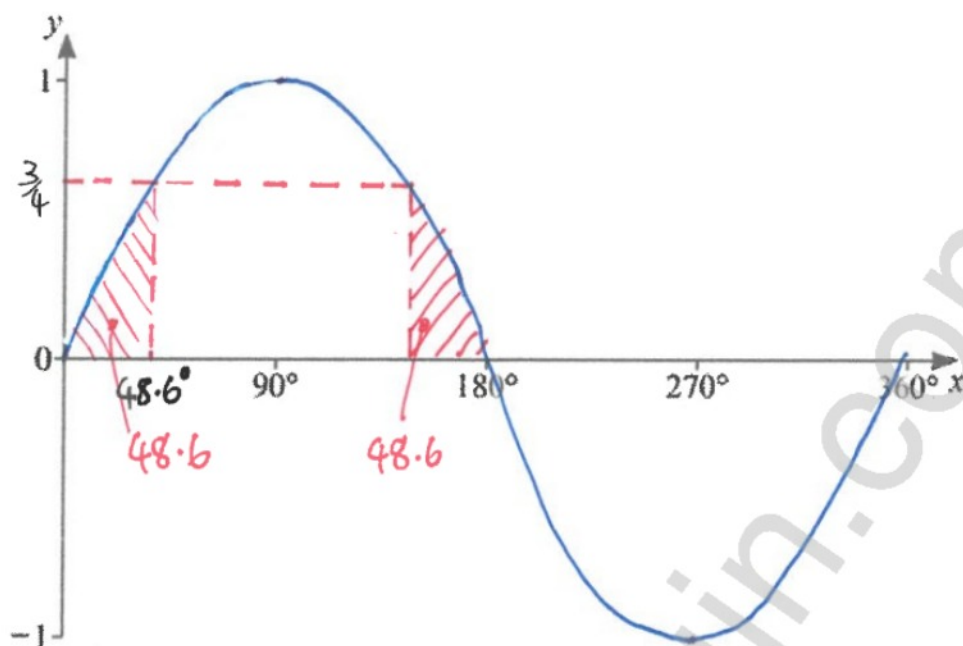
$$\begin{aligned}
 4 \cos x + 2 &= 3 \\
 -2 &\quad -2 \\
 4 \cos x &= 1 \\
 \div 4 &\quad \div 4 \\
 \cos x &= \frac{1}{4}
 \end{aligned}$$

$$\begin{aligned}
 x &= \cos^{-1}\left(\frac{1}{4}\right) \\
 &= 75.5^\circ \text{ use graph}
 \end{aligned}$$

$$270 + 14.5 = 284.5^\circ$$

$$x = 75.5^\circ \text{ and } x = 284.5^\circ \quad [3]$$

- 8 (a) (i) On the axes, sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

- (ii) Describe fully the symmetry of the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.

No reflective symmetry

Rotational symmetry, order 2

[2]

- (b) Solve $4 \sin x - 1 = 2$ for $0^\circ \leq x \leq 360^\circ$.

$$4 \sin x - 1 = 2$$

$$+1 \quad +1$$

$$4 \sin x = 3$$

$$\div 4 \quad \div 4$$

$$\sin x = \frac{3}{4}$$

$$x = \sin^{-1}\left(\frac{3}{4}\right)$$

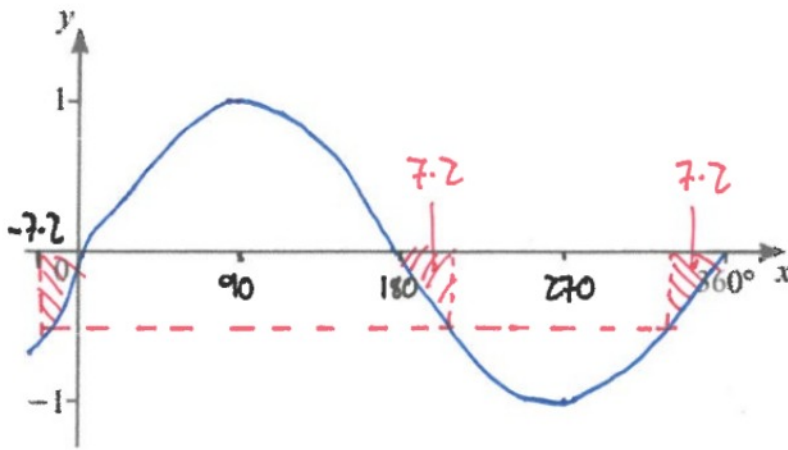
$$= 48.6^\circ$$

use graph

$$180 - 48.6 = 131.4^\circ$$

$$x = 48.6^\circ \text{ and } x = 131.4^\circ \quad [3]$$

20 (a)



Sketch the graph of $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$.

[2]

(b) Solve $3 - 2\sin x = \frac{13}{4}$ for $0^\circ \leq x \leq 360^\circ$.

$$3 - 2\sin x = \frac{13}{4}$$

$$-2\sin x = \frac{1}{4}$$

$$\sin x = -\frac{1}{8}$$

$$x = \sin^{-1}\left(-\frac{1}{8}\right)$$

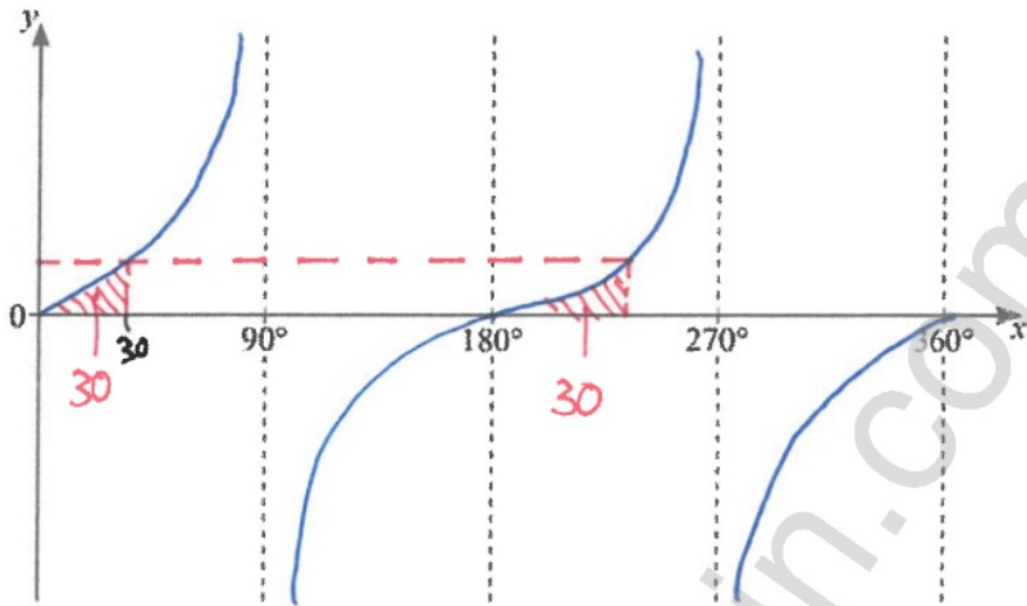
$$= -7.2^\circ \text{ use graph}$$

$$180 + 7.2 = 187.2^\circ$$

$$360 - 7.2 = 352.8^\circ$$

$$x = 187.2^\circ \text{ or } x = 352.8^\circ \quad [3]$$

12 (a) Sketch the graph of $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

(b) Find x when $\tan x = \frac{1}{\sqrt{3}}$ and $0^\circ \leq x \leq 360^\circ$.

$$x = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$$

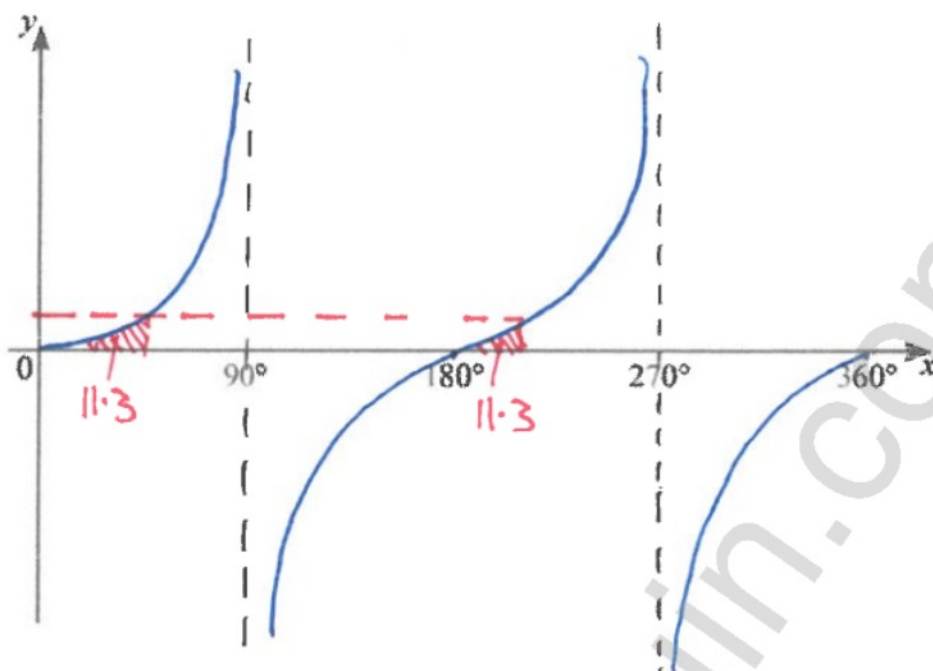
$$= \underline{30^\circ}$$

use graph

$$180 + 30 = \underline{210^\circ}$$

$$\underline{30^\circ \text{ or } 210^\circ} \quad [2]$$

19 (a) Sketch the graph of $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

(b) Solve the equation $5 \tan x = 1$ for $0^\circ \leq x \leq 360^\circ$.

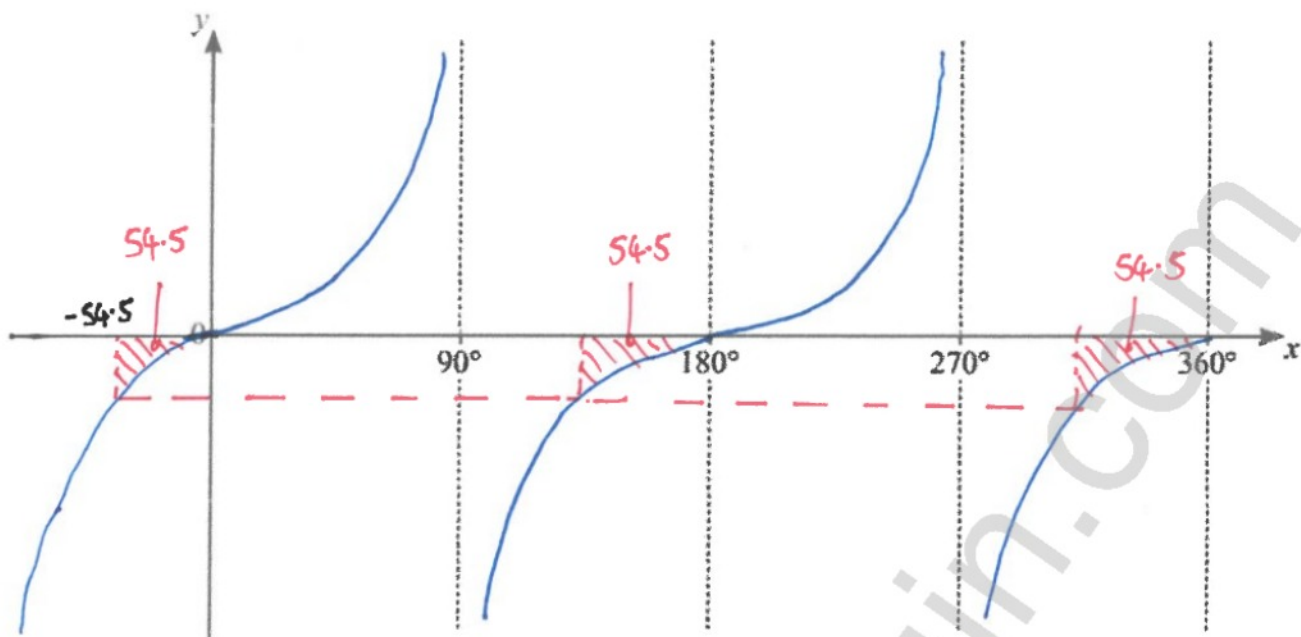
$$5 \tan x = 1 \quad \div 5 \quad \div 5 \quad x = 11.3^\circ \quad \text{use graph: } 180 + 11.3 = 191.3^\circ$$

$$\tan x = \frac{1}{5}$$

$$x = \tan^{-1}\left(\frac{1}{5}\right)$$

$$x = 11.3^\circ \quad \text{or} \quad x = 191.3^\circ \quad [2]$$

(b)



(i) On the diagram, sketch the graph of $y = \tan x$ for $0^\circ \leq x \leq 360^\circ$.

[2]

(ii) Solve the equation $5 \tan x = -7$ for $0^\circ \leq x \leq 360^\circ$.

$$5 \tan x = -7$$

$$\div 5 \quad \div 5$$

$$\tan x = \frac{-7}{5}$$

$$x = \tan^{-1}\left(\frac{-7}{5}\right)$$

$$= -54.5^\circ \text{ use graph}$$

$$180 - 54.5 = 125.5^\circ$$

$$360 - 54.5 = 305.5^\circ$$

$$x = 125.5^\circ \text{ or } x = 305.5^\circ \quad [3]$$

23 Find all the solutions of $4 \sin x = 3$ for $0^\circ \leq x \leq 360^\circ$.

$$4 \sin x = 3$$

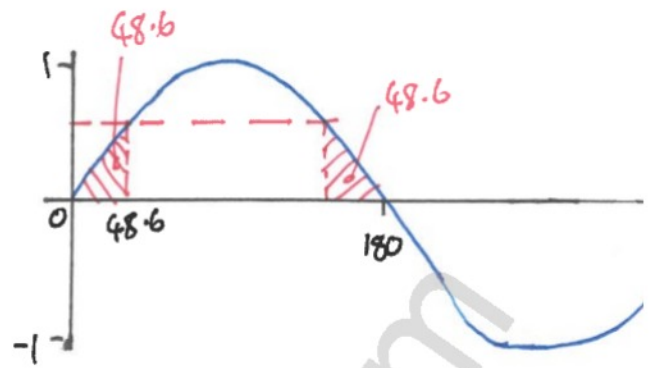
$$\div 4 \quad \div 4$$

$$\sin x = \frac{3}{4}$$

$$x = \sin^{-1}\left(\frac{3}{4}\right)$$

$$= 48.6^\circ \text{ use graph } \rightarrow 180 - 48.6 = 131.4^\circ$$

$$48.6^\circ \text{ or } 131.4^\circ [2]$$



19 Solve the equation $2 + 5 \cos x = 0$ for $0^\circ \leq x \leq 360^\circ$.

$$2 + 5 \cos x = 0$$

$$-2 \quad -2$$

$$5 \cos x = -2$$

$$\div 5 \quad \div 5$$

$$\cos x = \frac{-2}{5}$$

$$x = \cos^{-1}\left(\frac{-2}{5}\right)$$

$$= 113.6^\circ \text{ use graph } \rightarrow 270 - 113.6 = 156.4^\circ$$



$$x = 113.6^\circ \text{ or } x = 226.4^\circ [3]$$

22 Solve the equation $7\sin x + 2 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$$7\sin x + 2 = 0$$

$$-2 \quad -2$$

$$7\sin x = -2$$

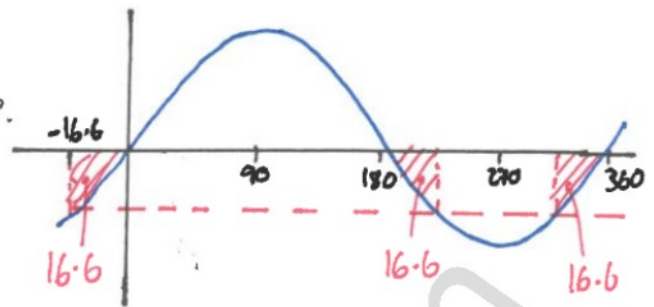
$$\div 7$$

$$\div 7$$

$$\sin x = \frac{-2}{7}$$

$$x = \sin^{-1}\left(\frac{-2}{7}\right)$$

$$= -16.6^\circ \text{ use graph}$$



$$180 + 16.6 = 196.6^\circ$$

$$360 - 16.6 = 343.4^\circ$$

$$\underline{196.6^\circ, 343.4^\circ} \quad [3]$$

20 Solve $3(2 + \cos x) = 5$ for $0^\circ \leq x \leq 360^\circ$.

$$6 + 3\cos x = 5$$

$$-6$$

$$-6$$

$$3\cos x = -1$$

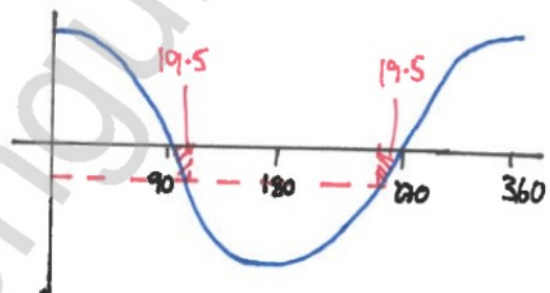
$$\div 3$$

$$\div 3$$

$$\cos x = \frac{-1}{3}$$

$$x = \cos^{-1}\left(\frac{-1}{3}\right)$$

$$= 109.5^\circ \text{ use graph}$$



$$270 - 19.5 = 250.5^\circ$$

$$\underline{109.5^\circ, 250.5^\circ} \quad [3]$$

25 Solve $3 \tan x = -4$ for $0^\circ \leq x \leq 360^\circ$.

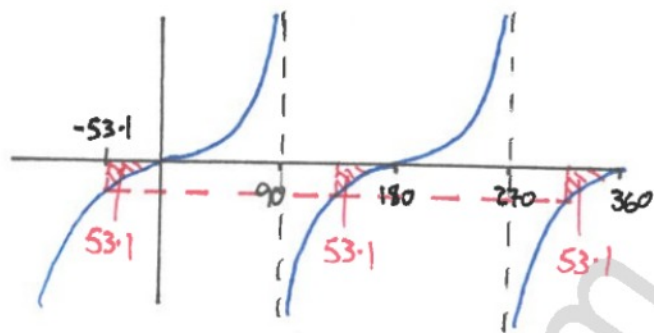
$$3 \tan x = -4$$

$$\div 3 \quad \div 3$$

$$\tan x = -\frac{4}{3}$$

$$x = \tan^{-1}\left(-\frac{4}{3}\right)$$

$$= -53.1^\circ \text{ use graph}$$



$$180 - 53.1 = 126.9^\circ$$

$$360 - 53.1 = 306.9^\circ$$

$$x = 126.9^\circ \text{ or } x = 306.9^\circ [3]$$

16 Solve the equation.

$$4(\cos x)^2 = 3 \text{ for } 0^\circ \leq x \leq 360^\circ$$

$$4(\cos x)^2 = 3$$

$$\div 4 \quad \div 4$$

$$(\cos x)^2 = \frac{3}{4}$$

$$\cos x = \pm \sqrt{\frac{3}{4}}$$

$$\cos x = \frac{\sqrt{3}}{2}$$

$$x = 30^\circ$$

use graph:

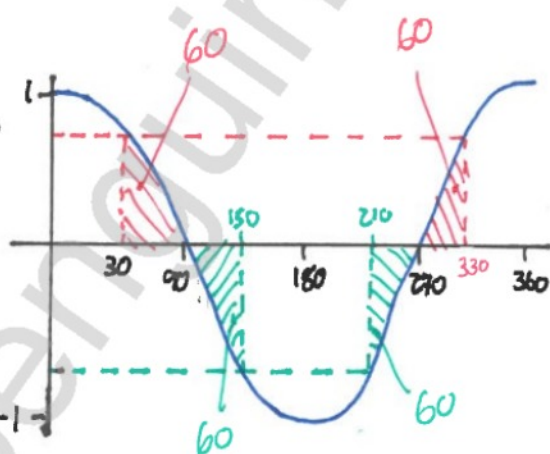
$$270 + 60 = 330^\circ$$

$$\cos x = -\frac{\sqrt{3}}{2}$$

$$x = 150^\circ$$

use graph:

$$270 - 60 = 210^\circ$$



$$x = 30^\circ, 150^\circ, 210^\circ, 330^\circ [3]$$

(c) (i) Solve the simultaneous equations.

$$2p + q = 2 \quad (1)$$

$$p - q = -\frac{1}{2} \quad (2)$$

$$\begin{aligned} (1) + (2): \quad 3p &= 1.5 \\ \div 3 \quad \quad \div 3 \\ \underline{p} &= \underline{0.5} \end{aligned}$$

$$\text{Sub into (1): } 2(0.5) + q = 2$$

$$\begin{aligned} 1 + q &= 2 \\ -1 \quad \quad -1 \\ \underline{q} &= \underline{1} \end{aligned}$$

$$p = \underline{0.5}$$

$$q = \underline{1} \quad [2]$$

(ii) Hence, for $0^\circ \leq u \leq 360^\circ$ and $0^\circ \leq v \leq 360^\circ$, solve the simultaneous equations.

$$2 \sin u + \cos v = 2$$

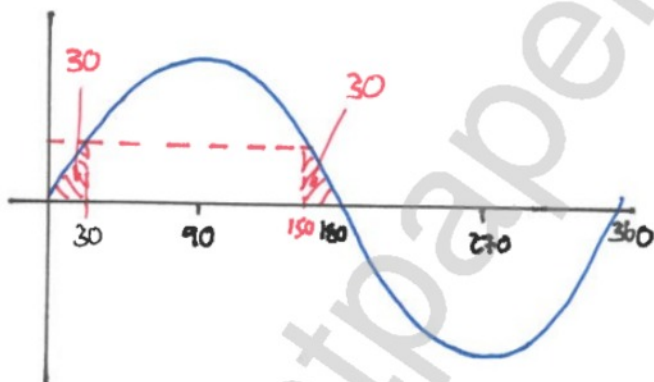
$$\sin u - \cos v = -\frac{1}{2}$$

$$\begin{aligned} \sin u &= p & \cos v &= q \\ \text{so: } \sin u &= 0.5 & \text{so: } \cos v &= 1 \end{aligned}$$

$$\underline{\sin u = 0.5:}$$

$$\begin{aligned} u &= \sin^{-1}(0.5) \\ &= \underline{30^\circ} \end{aligned}$$

$$\begin{aligned} &\text{use graph} \rightarrow 180 - 30 \\ &= \underline{150^\circ} \end{aligned}$$

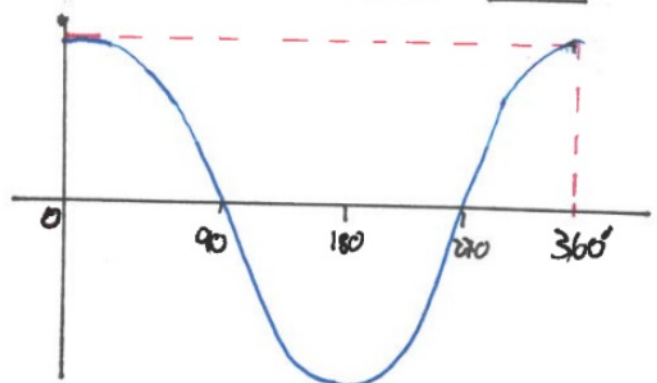


$$u = \underline{30^\circ} \text{ or } \underline{150^\circ}$$

$$\underline{\cos v = 1:}$$

$$v = \cos^{-1}(1)$$

$$= \underline{0^\circ} \quad \text{use graph} \rightarrow \underline{360^\circ}$$



$$v = \underline{0^\circ} \text{ or } \underline{360^\circ}$$