

- 1 Solve, for $0 \leq x < 180^\circ$, the equation,

$$\cos(2x + 15) = 0.3$$

Give your answers to one decimal place.

$$2x + 15 = \cos^{-1}(0.3)$$

$$2x + 15 = 72.54, 287.46$$

$$x = \underline{28.8^\circ}, \underline{136.2^\circ}$$

360 - Ans

- 2 Solve, for $0 \leq \theta < 180^\circ$, the equation,

$$\sin(3\theta - 15) = 0.7$$

Give your answers to two decimal places.

$$3\theta - 15 = \sin^{-1}(0.7)$$

$$= 44.4^\circ, 135.6^\circ, 404.4^\circ, 495.6^\circ$$

$$\theta = \underline{19.81^\circ}, \underline{40.19^\circ}, \underline{129.81^\circ}, \underline{160.19^\circ}$$

2nd answer = 180 - Ans

- 3 Solve, for $-180 \leq \theta < 180^\circ$, the equation,

$$\tan(\theta + 30) = -2.5$$

Give your answers to one decimal place.

$$\theta + 30 = \tan^{-1}(-2.5)$$

$$\theta + 30 = -68.2^\circ, 111.8^\circ$$

$$\theta = \underline{-98.2^\circ}, \underline{88.8^\circ}$$

2nd answer
180 + Ans

- 4 Solve, for $0 \leq x < 360^\circ$, the equation,

$$5\cos(x - 40) = 2$$

Give your answers to two decimal places.

$$\cos(x - 40) = \frac{2}{5}$$

$$x - 40 = 66.42^\circ, 293.58^\circ$$

$$x = \underline{106.42^\circ}, \underline{333.58^\circ}$$

- 5 Solve, for $0 \leq x < 360^\circ$, the equation,

$$\tan^2(x) = 3$$

$$\tan x = \pm \sqrt{3}$$

$$\tan x = \sqrt{3}$$

$$x = \underline{\underline{60^\circ}}, \underline{\underline{240^\circ}}$$

$$\tan x = -\sqrt{3}$$

$$x = \underline{\underline{-60^\circ}}, \underline{\underline{120^\circ}}, \underline{\underline{300^\circ}}$$

$$x = \underline{\underline{60^\circ}}, \underline{\underline{120^\circ}}, \underline{\underline{240^\circ}}, \underline{\underline{300^\circ}}$$

- 6 (a) Show that the equation

$$2\sin^2 x = 7\cos x + 5$$

Can be written in the form

$$2\cos^2 x + 7\cos x + 3 = 0$$

(3)

- (b) Hence solve, for $0 \leq x < 360^\circ$, the equation,

$$2\sin^2 x = 7\cos x + 5$$

(5)

a/

$$\cos^2 x + \sin^2 x = 1$$

$$\sin^2 x = 1 - \cos^2 x$$

$$2(1 - \cos^2 x) = 7\cos x + 5$$

$$2 - 2\cos^2 x = 7\cos x + 5$$

$$\underline{\underline{0 = 2\cos^2 x + 7\cos x + 3}}$$

b/

$$2\cos^2 x + 7\cos x + 3 = 0$$

$$(2\cos x + 1)(\cos x + 3) = 0$$

$$\cos x = -\frac{1}{2} \quad \cos x = -3$$

$$x = \underline{\underline{120^\circ}}, \underline{\underline{240^\circ}} \quad \times \text{ no sol.}$$

7 (a) Show that the equation

$$6\cos^2 x = 4 - \sin x$$

Can be written in the form

$$6\sin^2 x - \sin x - 2 = 0 \quad (3)$$

(b) Hence solve, for $0 \leq x < 360^\circ$, the equation,

$$6\cos^2 x = 4 - \sin x \quad (6)$$

Give your answers to one decimal place where appropriate.

a/ $6(1 - \sin^2 x) = 4 - \sin x$

$$6 - 6\sin^2 x = 4 - \sin x$$

$$0 = \underline{6\sin^2 x - \sin x - 2}$$

b/ $(3\sin x - 2)(2\sin x + 1) = 0$

$$\sin x = \frac{2}{3} \quad \sin x = -\frac{1}{2}$$

$$x = 41.8^\circ, 138.2^\circ \quad x = \cancel{-30^\circ}, 210^\circ, 330^\circ$$

$$x = \underline{41.8^\circ}, \underline{138.2^\circ}, \underline{210^\circ}, \underline{330^\circ}$$

8 Find all values for x in the interval $0 \leq x < 360^\circ$, for which

$$2\cos^2 x - 3\sin^2 x = 14\cos x$$

Give your answers to one decimal place.

$$2\cos^2 x - 3(1 - \cos^2 x) = 14\cos x$$

$$2\cos^2 x - 3 + 3\cos^2 x = 14\cos x$$

$$5\cos^2 x - 14\cos x - 3 = 0$$

$$(5\cos x + 1)(\cos x - 3) = 0$$

$$\cos x = -\frac{1}{5} \quad \cos x = 3$$

x no sol's.

$$x = \underline{101.5^\circ}, \underline{258.5^\circ}$$

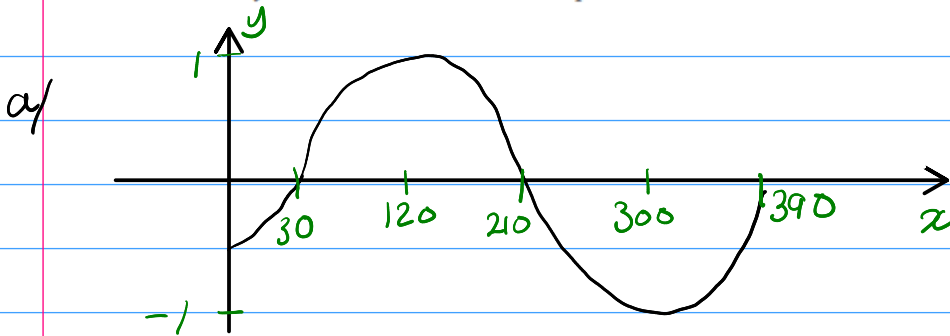
9 (a) Sketch the graph of $y = \sin(x - 30)$ for x in the interval $0 \leq x < 360^\circ$ (2)

(b) Find all values for x in the interval $0 \leq x < 360^\circ$, for which

$$\sin(x - 30) = 0.3$$

(4)

Give your answers to one decimal place.



b/

$$\sin(x - 30) = 0.3$$

$$x - 30 = 17.5^\circ, 162.5^\circ$$

$$x = \underline{\underline{47.5^\circ}}, \underline{\underline{192.5^\circ}}$$

10 Find all values for x in the interval $0 \leq x < 360^\circ$, for which

$$3 \tan x = 4 \sin x$$

$$\tan x = \frac{\sin x}{\cos x}$$

Give your answers to one decimal place where appropriate.

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

$$3 \sin x = 4 \sin x \cos x$$

$$0 = 4 \sin x \cos x - 3 \sin x$$

$$0 = \sin x (4 \cos x - 3)$$

$$\sin x = 0 \quad \cos x = \frac{3}{4}$$

$$x = \underline{\underline{0^\circ}}, \underline{\underline{180^\circ}}$$

$$x = \underline{\underline{41.4^\circ}}, \underline{\underline{318.6^\circ}}$$

11 (a) Show that the equation

$$3\sin 2x \tan 2x = \cos 2x + 2$$

Can be written in the form

$$4\cos^2 2x + 2\cos 2x - 3 = 0$$

(4)

(b) Find all values for x in the interval $0 \leq x < 180^\circ$, for which

$$3\sin 2x \tan 2x = \cos 2x + 2$$

Give your answers to two decimal places.

(6)

a/

$$3 \sin 2x \cdot \frac{\sin 2x}{\cos 2x} = \cos 2x + 2$$

$$\frac{3 \sin^2 2x}{\cos 2x} = \cos 2x + 2$$

$$3 \sin^2 2x = \cos^2 2x + 2 \cos 2x$$

$$3(1 - \cos^2 2x) = \cos^2 2x + 2 \cos 2x$$

$$3 - 3\cos^2 2x = \cos^2 2x + 2 \cos 2x$$

$$0 = 4 \cos^2 2x + 2 \cos 2x - 3$$

b/

$$\cos 2x = \frac{-1 + \sqrt{13}}{4} \quad \cos 2x = \frac{-1 - \sqrt{13}}{4}$$

$$2x = 49.35^\circ, 310.65^\circ \quad \underline{\underline{\text{no sols}}}$$

$$x = \underline{\underline{24.78^\circ}}, \underline{\underline{155.32^\circ}}$$

12 (a) Show that the equation

$$1 + \cos x = 3 \tan x \sin x$$

$$\tan x = \frac{\sin x}{\cos x}$$

Can be written in the form

$$4\cos^2 x + \cos x - 3 = 0$$

(4)

(b) Hence solve, for $0 \leq x < 360^\circ$, the equation,

$$1 + \cos x = 3 \tan x \sin x$$

(5)

Give your answers to one decimal place where appropriate.

a/

$$1 + \cos x = \frac{3 \sin^2 x}{\cos x}$$

$$\cos x + \cos^2 x = 3 \sin^2 x$$

$$\sin^2 x = 1 - \cos^2 x$$

$$\cos x + \cos^2 x = 3(1 - \cos^2 x)$$

$$\cos x + \cos^2 x = 3 - 3\cos^2 x$$

$$4\cos^2 x + \cos x - 3 = 0$$

b/

$$(4 \cos x - 3)(\cos x + 1)$$

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

$$\cos x = -1$$

$$x = \underline{\underline{41.4^\circ}}, \underline{\underline{318.6^\circ}} \quad x = \underline{\underline{180}}$$

13 (a) Show that

$$\frac{6\cos^2\theta + 7\sin\theta - 8}{1 - 2\sin\theta} \equiv 3\sin\theta - 2$$

(4)

(b) Hence solve, for $0 \leq \theta < 360^\circ$, the equation,

$$\frac{6\cos^2\theta + 7\sin\theta - 8}{1 - 2\sin\theta} = 2\cos\theta - 2$$

(3)

$$\frac{6(1 - \sin^2\theta) + 7\sin\theta - 8}{1 - 2\sin\theta}$$

$$\cos^2\theta = 1 - \sin^2\theta$$

$$\frac{6 - 6\sin^2\theta + 7\sin\theta - 8}{1 - 2\sin\theta}$$

$$\frac{-6\sin^2\theta + 7\sin\theta - 2}{1 - 2\sin\theta}$$

$\times -1$

$\times -1$

$$\frac{6\sin^2\theta - 7\sin\theta + 2}{2\sin\theta - 1}$$

$$\frac{(2\sin\theta - 1)(3\sin\theta - 2)}{(2\sin\theta - 1)}$$

$$\underline{\underline{3\sin\theta - 2}}$$

b/

$$3\sin\theta - 2 = 2\cos\theta - 2$$

$$3\sin\theta = 2\cos\theta$$

$$3\frac{\sin\theta}{\cos\theta} = 2$$

$$3\tan\theta = 2$$

$$\tan\theta = \frac{2}{3}$$

$$\theta = \underline{\underline{33.7^\circ}}, \underline{\underline{213.7^\circ}}$$

14 (a) Solve, for $360 \leq \theta < 720^\circ$, the equation,

$$3 \cos \theta = 8 \tan \theta \quad (5)$$

The first four positive solutions, in order of size, of the equation

$$\cos(2a + 50) = 0.7$$

are a_1, a_2, a_3 and a_4

(b) To the nearest degree find the value of a_4 .

(3)

a/

$$3 \cos \theta = \frac{8 \sin \theta}{\cos \theta}$$

$$3 \cos^2 \theta = 8 \sin \theta$$

$$3(1 - \sin^2 \theta) = 8 \sin \theta$$

$$3 - 3 \sin^2 \theta = 8 \sin \theta$$

$$0 = 3 \sin^2 \theta + 8 \sin \theta - 3$$

$$0 = (3 \sin \theta - 1)(\sin \theta + 3)$$

$$\sin \theta = \frac{1}{3} \quad \sin \theta = -3$$

× no sols

$$\theta = 19.5^\circ, 160.5^\circ, 379.5^\circ, 520.5^\circ$$

$$\theta = \underline{\underline{379.5^\circ}} \text{ and } \underline{\underline{520.5^\circ}}$$

b/

$$\cos(2a + 50) = 0.7 \quad (1)$$

$$2a + 50 = 45.57, 314.43, \dots$$

$$2a_4 + 50 = 765.57$$

$$a_4 = \underline{\underline{358^\circ}}$$

15 Solve the equation $\tan^2 2x - 3 = 0$ giving all the solutions for the interval $0 \leq x < 360^\circ$

$$\tan^2 2x = 3$$

$$\tan 2x = \pm \sqrt{3}$$

$$2x = 60^\circ, 240^\circ, 420^\circ, 600^\circ \quad 2x = -60^\circ, 120^\circ, 300^\circ, 480^\circ, 660^\circ$$

$$x = \underline{30^\circ}, \underline{60^\circ}, \underline{120^\circ}, \underline{150^\circ}, \underline{210^\circ}, \underline{240^\circ}, \underline{300^\circ}, \underline{330^\circ}$$

16 Given $\cos(75^\circ) = \frac{\sqrt{6} - \sqrt{2}}{4}$ and $\sin(75^\circ) = \frac{\sqrt{6} + \sqrt{2}}{4}$

Show that $\tan^2(75^\circ)$ can be written in the form $a + b\sqrt{3}$

Fully justify your answer.

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\tan 75 = \frac{\sqrt{6} + \sqrt{2}}{4} \div \frac{\sqrt{6} - \sqrt{2}}{4}$$

$$= \frac{\sqrt{6} + \sqrt{2}}{\sqrt{6} - \sqrt{2}}$$

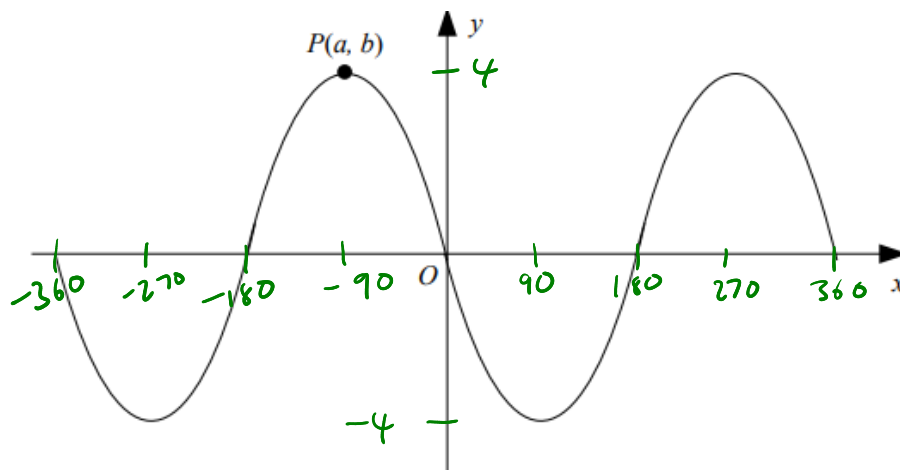
$$= 2 + \sqrt{3}$$

$$\tan^2 75 = (2 + \sqrt{3})(2 + \sqrt{3})$$

$$= 4 + 4\sqrt{3} + 3$$

$$= \underline{\underline{7 + 4\sqrt{3}}}$$

17



The graph shows part of the curve with equation $y = 4 \sin x^\circ$

The point P is a maximum point on the curve with a being the smallest negative value of x that a maximum occurs.

(a) State the value of a and the value of b . (1)

(b) State the coordinates of the point to which P is mapped by the transformation which transforms the curve with equation $y = 4 \sin x^\circ$ to the curve with equation

(i) $y = 4 \sin(x + 28)$

(ii) $y = 4 \sin(3x)$ (2)

(c) Solve, for $360 \leq \theta < 720^\circ$,

$$4 \sin \theta = \tan \theta$$

Give your answers to one decimal place where appropriate. (5)

a/ $a = -90 \quad b = 4$

b/ i/ $(-118, 4)$

ii/ $(-30, 4)$

c/ $4 \sin \theta = \frac{\sin \theta}{\cos \theta}$

$$4 \sin \theta \cos \theta = \sin \theta$$

$$4 \sin \theta \cos \theta - \sin \theta = 0$$

$$\sin \theta (4 \cos \theta - 1) = 0$$

$$\sin \theta = 0 \quad \cos \theta = \frac{1}{4}$$

$$\theta = 0, 180, \underline{360}, \underline{540}$$

$$\theta = \underline{75.5^\circ}, \underline{284.5^\circ}, \underline{435.5^\circ}, \underline{644.5^\circ}$$

$$\theta = \underline{360^\circ}, \underline{435.5^\circ}, \underline{540^\circ}, \underline{644.5^\circ}$$

18 Solve $\tan 2\theta - 1 = 0$ giving all the solutions for the interval $0 \leq \theta < 360^\circ$

$$\tan 2\theta = 1$$

$$2\theta = 45^\circ, 225^\circ, 405^\circ, 585^\circ$$

$$\theta = \underline{\underline{22.5^\circ}}, \underline{\underline{112.5^\circ}}, \underline{\underline{202.5^\circ}}, \underline{\underline{292.5^\circ}}$$

19 (a) Solve $6\sin^2\theta = \cos\theta + 4$ giving all the solutions for the interval $0 \leq \theta < 360^\circ$ (4)

(b) Hence, hence solve $6\sin^2 2\theta = \cos 2\theta + 4$ giving all the solutions for the interval $0 \leq \theta < 360^\circ$ (2)

a) $\sin^2\theta = 1 - \cos^2\theta$

$$6(1 - \cos^2\theta) = \cos\theta + 4$$

$$6 - 6\cos^2\theta = \cos\theta + 4$$

$$0 = 6\cos^2\theta + \cos\theta - 2$$

$$0 = (2\cos\theta - 1)(3\cos\theta + 2)$$

$$\cos\theta = \frac{1}{2} \quad \cos\theta = -\frac{2}{3}$$

$$\theta = \underline{\underline{60^\circ}}, \underline{\underline{300^\circ}}$$

$$\theta = \underline{\underline{131.8^\circ}}, \underline{\underline{228.2^\circ}}$$

b) $2\theta = 60^\circ, 300^\circ, 420^\circ, 660^\circ$ $2\theta = 131.8^\circ, 228.2^\circ, 491.8^\circ, 588.2^\circ$

$$\theta = \underline{\underline{30^\circ}}, \underline{\underline{150^\circ}}, \underline{\underline{210^\circ}}, \underline{\underline{330^\circ}}$$

$$\theta = \underline{\underline{65.9^\circ}}, \underline{\underline{114.1^\circ}}, \underline{\underline{245.9^\circ}}, \underline{\underline{294.1^\circ}}$$

- 20 At 12 noon the temperature in Harry's house is 22°C
At 6 pm the temperature in Harry's house is 25°C

Harry models the temperature in his house, T , by the formula

$$T = A + B \sin(15h)$$

where h is the number of hours after 12 noon.

- (a) State the value that Harry should use for A . (1)
(b) State the value that Harry should use for B . (1)
(c) Using this model, calculate the temperature in Harry's house at 9 pm. (1)
(d) Using the model find the number of hours in a day that the temperature will be above 23.5°C . (4)

a/ 22

b/ $25 = 22 + B \sin(90)$

$B = 3$

c/ $T = 22 + 3 \sin(135)$

$= 24.1^{\circ}$ (3sf)

d/ $23.5 = 22 + 3 \sin(15h)$

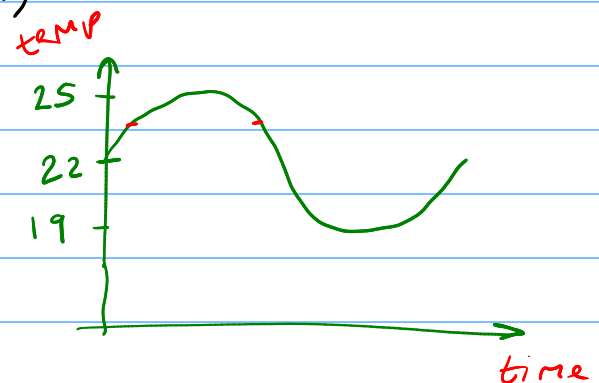
$\sin(15h) = \frac{1}{2}$

$15h = 30, 150$

$h = 2, 10$

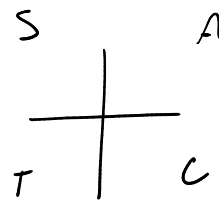
$10 - 2 = 8$

8 hours above 23.5°

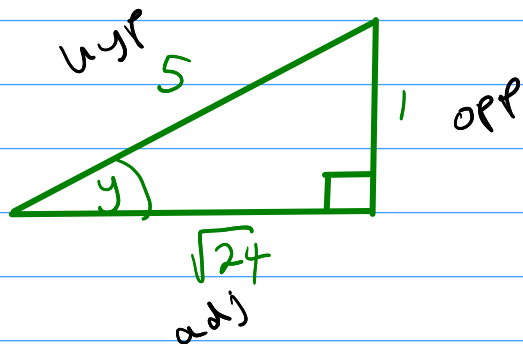


21 It is given that $\sin y = -0.2$ and $180^\circ < y < 270^\circ$

Find the exact value of $\cos y$



$$\sin y = -\frac{1}{5}$$



cos is negative
between 180 and 270

$$\sqrt{5^2 - 1^2} = \sqrt{24}$$

$$\underline{\underline{\cos y = -\frac{\sqrt{24}}{5}}}$$

22 Jacob has to solve the equation

$$3 - \sin x = 1 + 2\cos^2 x$$

where $-180^\circ \leq x < 180^\circ$

Jacob's working is as follows:

$$\begin{aligned} 3 - \sin x &= 1 + 2\cos^2 x \\ 2 - \sin x &= 2\cos^2 x \quad \checkmark \\ 2 - \sin x &= 2(1 - \sin^2 x) \quad \checkmark \\ 2 - \sin x &= 2 - 2\sin^2 x \quad \checkmark \\ -\sin x &= -2\sin^2 x \quad \checkmark \\ 1 &= 2\sin x & 2\sin^2 x - \sin x &= 0 \\ \sin x &= 0.5 \\ x &= 30^\circ, 150^\circ \end{aligned}$$

(a) Explain the two errors that Jacob has made.

(2)

(b) Write down all the values of x that satisfy the equation

$$3 - \sin x = 1 + 2\cos^2 x$$

where $-180^\circ \leq x < 180^\circ$

(2)

- a/
- ① Jacob should not have divided through by $\sin x$. This results in not getting the answer $\sin x = 0$
 - ② He did not find all solutions for $\sin x = 0.5$ in the range

b/

$$\begin{aligned} 2\sin^2 x - \sin x &= 0 \\ \sin x(2\sin x - 1) &= 0 \end{aligned}$$

$$\begin{aligned} \sin x &= 0 & \sin x &= \frac{1}{2} \\ x &= \underline{0^\circ}, \underline{-180^\circ} & x &= \underline{30^\circ}, \underline{150^\circ} \end{aligned}$$

23 Find all solutions of

$$6\cos^2 x + 5\sin x - 7 = 0$$

where $0^\circ \leq x < 360^\circ$

Give your solutions to the nearest degree.

$$6(1 - \sin^2 x) + 5\sin x - 7 = 0$$

$$6 - 6\sin^2 x + 5\sin x - 7 = 0$$

$$-6\sin^2 x + 5\sin x - 1 = 0$$

$$6\sin^2 x - 5\sin x + 1 = 0$$

$$(6\sin x + 1)(\sin x - 1) = 0$$

$$\sin x = -\frac{1}{6} \qquad \sin x = 1$$

$$x = -9^\circ, \underline{190^\circ}, \underline{350^\circ} \qquad x = \underline{90^\circ}$$

24 (a) Show that the equation

$$2\sin^2 x = 4\cos^2 x - \cos x$$

can be expressed in the form

$$6\cos^2 x - \cos x - 2 = 0 \tag{3}$$

(b) Hence, solve the equation

$$2\sin^2 2\theta = 4\cos^2 2\theta - \cos 2\theta$$

giving all values of θ between 0° and 180° , correct to 1 decimal place.

(5)

$$2\sin^2 x = 4\cos^2 x - \cos x$$

$$2(1 - \cos^2 x) = 4\cos^2 x - \cos x$$

$$2 - 2\cos^2 x = 4\cos^2 x - \cos x$$

$$2 = 6\cos^2 x - \cos x$$

$$0 = \underline{\underline{6\cos^2 x - \cos x - 2}}$$

b/

$$6\cos^2 2\theta - \cos 2\theta - 2 = 0$$

$$\cos 2\theta = \frac{2}{3} \qquad \cos 2\theta = -\frac{1}{2}$$

$$2\theta = 48.2^\circ, 311.8^\circ \qquad 2\theta = 120^\circ, 240^\circ$$

$$\theta = \underline{24.1^\circ}, \underline{60^\circ}, \underline{120^\circ}, \underline{155.9^\circ}$$

25 (a) Solve the equation $\sin^2 x = 0.25$ for $0^\circ \leq x < 360^\circ$ (3)

(b) Solve the equation $\tan 3x = 1$ for $0^\circ \leq x < 180^\circ$ (3)

a/
$$\sin x = \pm \sqrt{0.25}$$

$$= \pm \frac{1}{2}$$

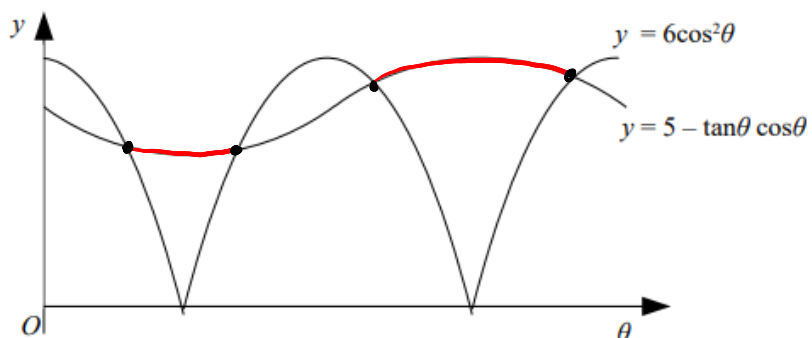
$$x = \underline{30^\circ}, \underline{150^\circ} \quad x = -30, \underline{210^\circ}, \underline{330^\circ}$$

b/ $\tan 3x = 1$

$3x = 45^\circ, 225^\circ, 405^\circ$

$x = \underline{15^\circ}, \underline{75^\circ}, \underline{135^\circ}$

26 (a) Show that the equation $5 - \tan \theta \cos \theta = 6 \cos^2 \theta$ can be expressed in the form $6 \sin^2 x - \sin x - 1 = 0$ (2)



The diagram shows parts of the curves $y = 6 \cos^2 \theta$ and $y = 5 - \tan \theta \cos \theta$, where θ is in degrees.

(b) Solve the inequality $5 - \tan \theta \cos \theta > 6 \cos^2 \theta$ for $0^\circ \leq \theta < 360^\circ$ (5)

a/
$$5 - \frac{\sin \theta \cos \theta}{\cos \theta} = 6(1 - \sin^2 \theta)$$

$$5 - \sin \theta = 6 - 6 \sin^2 \theta$$

$$\underline{6 \sin^2 \theta - \sin \theta - 1 = 0}$$

b/ $\sin \theta = \frac{1}{2} \quad \sin \theta = -\frac{1}{3}$

$\theta = \underline{30^\circ}, \underline{150^\circ} \quad \theta = -19.5, \underline{199.5^\circ}, \underline{340.5^\circ}$

$\underline{30 < \theta < 150} \quad \text{or} \quad \underline{199.5 < \theta < 340.5^\circ}$

27 (a) Solve the equation $\sin^2 x = \tan^2 x$ for $0^\circ \leq x \leq 180^\circ$

(5)

(b) Prove that $\frac{2 \sin x - \cos^2 x + 1}{2 + \sin x} \equiv \sin x$

(3)

a/
$$\sin^2 x = \frac{\sin^2 x}{\cos^2 x}$$

$$\sin^2 x \cos^2 x = \sin^2 x$$

$$\sin^2 x \cos^2 x - \sin^2 x = 0$$

$$\sin^2 x (\cos^2 x - 1) = 0$$

$$\sin^2 x = 0 \quad \cos^2 x = 1$$

$$\sin x = 0 \quad \cos x = \pm 1$$

$$x = \underline{\underline{0^\circ}}, \underline{\underline{180^\circ}} \quad x = \underline{\underline{0^\circ}}, \underline{\underline{180^\circ}}$$

b/
$$\frac{2 \sin x - \cos^2 x + 1}{2 + \sin x}$$

$$\frac{2 \sin x - (1 - \sin^2 x) + 1}{2 + \sin x}$$

$$\frac{2 \sin x - 1 + \sin^2 x + 1}{2 + \sin x}$$

$$\frac{\sin^2 x + 2 \sin x}{2 + \sin x}$$

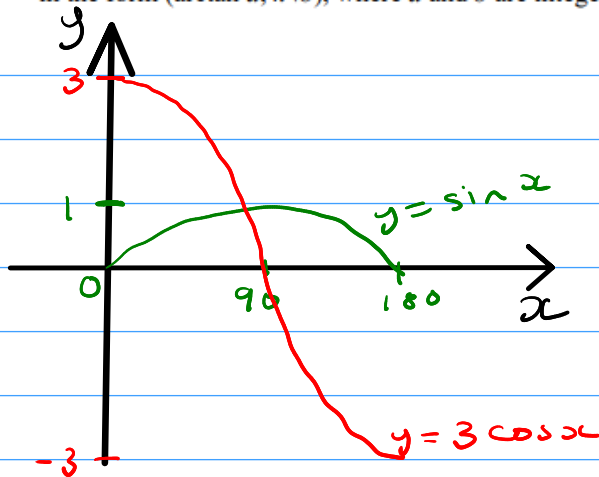
$$\frac{\sin x (\cancel{\sin x + 2})}{(\cancel{\sin x + 2})}$$

$$\underline{\underline{\sin x}}$$

28 (a) Sketch the graphs of $y = 3\cos x$ and $y = \sin x$ for $0^\circ \leq x \leq 180^\circ$ on the same axes. (2)

(b) Find the exact coordinates of the point of intersection of these graphs, giving the answer in the form $(\arctan a, k\sqrt{b})$, where a and b are integers and k is rational. (4)

a)



b/

$$\sin x = 3 \cos x$$

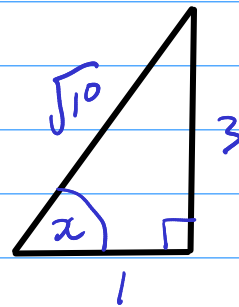
$$\tan x = 3$$

$$x = \arctan 3$$

$$\tan x = \frac{0}{1} = \frac{3}{1}$$

$$\sin x = \frac{3}{\sqrt{10}}$$

$$= \frac{3}{10}\sqrt{10}$$



$$\sqrt{3^2 + 1^2} = \sqrt{10}$$

\therefore intersection at $(\arctan 3, \frac{3}{10}\sqrt{10})$

29 Solve the equation $5 \sin x = 3 \cos x$ for $0^\circ \leq x \leq 360^\circ$

$$5 \tan x = 3$$

$$\tan x = \frac{3}{5}$$

$$x = \underline{\underline{31.0^\circ}}, \underline{\underline{211^\circ}} \quad (3 \text{ sf})$$

30 Solve the equation $24 \tan x + 5 \cos x = 0$ for $0^\circ \leq x \leq 360^\circ$, giving your answers to the nearest degree

$$\frac{24 \sin x}{\cos x} + 5 \cos x = 0$$

$$24 \sin x + 5 \cos^2 x = 0$$

$$24 \sin x + 5(1 - \sin^2 x) = 0$$

$$24 \sin x + 5 - 5 \sin^2 x = 0$$

$$5 \sin^2 x - 24 \sin x - 5 = 0$$

$$\sin x = 5 \quad \sin x = -\frac{1}{5}$$

no sols

$$x = -11.5^\circ, \underline{\underline{192^\circ}}, \underline{\underline{348^\circ}}$$