

Question One

$$a) V_{min} = \sqrt{\frac{W}{S} \times \frac{2}{P} \times \frac{1}{C_L}}$$

$$V_{min}^2 = \frac{W}{S} \times \frac{2}{P} \times \frac{1}{C_L}$$

$$V_{min}^2 \times P \times C_L = \frac{W}{S} \times 2 \times 1$$

$$\frac{2W \times 1}{V_{min}^2} = S P C_L$$

$$\frac{V_{min}^2 \times P \times C_L}{2 \times 1} =$$

$$\frac{2W \times 1}{V_{min}^2 \times P \times C_L} = S$$

$$S = \frac{2 \times 490332 \times 1}{200^2 \times 0.41 \times 0.52} = 114.993$$

$$114.99 \text{ m}^2$$

b) solve for x

$$i) \frac{8x-3}{5} = \frac{-5x+6}{-3}$$

$$-24x+9 = -25x+30$$

$$9-30 = -x$$

$$-21 = -x$$

$$x = 21$$

$$ii) \frac{(4x-1)}{3} - \frac{x}{4} = \frac{(4x+3)}{2}$$

$$\frac{2(4x-1)}{6} - \frac{2x}{4} = \frac{12(4x+3)}{12}$$

$$8x-1-2x = 48x+3$$

$$ii) \frac{(4x-1)}{3} - \frac{x}{4} = \frac{4x+3}{2}$$

$$\frac{4x-1}{3} = \frac{4x+3}{2} + \frac{x}{4}$$

$$\frac{4}{3}x - 1 = 2\frac{1}{4}x + 1.5$$

$$\frac{4}{3}x - 2\frac{1}{4}x = 2.5$$

$$1.3x - 2.25x = 2.5$$

$$-0.95x = 2.5$$

$$x = \frac{2.5}{-0.95} = -2.72$$

$$iii) 2\log(5x+3) = \log(x+1) + \log(x+2)$$

$$(5x+3)^2 = (x+1)(x+2)$$

$$25x^2 + 30x + 9 = x^2 + 3x + 2$$

$$24x^2 + 27x + 7 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = -0.405 \text{ or } -0.720$$

iv) $7^x \times 3^{x+2} = 5^{x-1}$

$$\log 7^x \times \log 3^{x+2} = \log 5^{x-1}$$

~~$$x \log 7 + (x+2) \log 3 = x-1 \log 5$$~~

$$x \log 7 + (x+2) \log 3 = (x-1) \log 5$$

$$x(0.845) + x+2(0.4477) = x-1(0.699)$$

$$0.845x + 0.477x + 0.954 = -0.699 + 0.699x$$

$$0.623x = -1.653$$

$$x = \frac{-1.653}{0.623} = -2.653$$

c)

i) $21R^2 + 24R + 5$

$$(7R) (3R) (5)$$

$$\begin{array}{r|l} 24 & \\ \hline 1 & 24 \\ 2 & 12 \\ 3 & 8 \\ 4 & 6 \end{array}$$

can't factor

ii) $81q^2 - 144u^2$

$$9(9q^2 - 16u^2)$$

$$3^2 \cdot 9 \quad 4^2 \cdot 12$$

$$9(3q+4u)(3q-4u)$$

iii) $tr - ty + ur - uy$

separate coefficient into one bracket

$$(t+u)(r-y)$$

$$\begin{array}{r|l} 27 & \\ \hline 9 & 3 \\ 27 & 1 \end{array}$$

i) $27R^2 + 24R + 5$

$$(9R+5)(3R+1)$$

$$\begin{array}{r|l} 24 & \\ \hline 8 & 3 \\ 6 & 4 \end{array}$$

d) factorisation method

$$i) x^2 + 9x + 8 = 0$$

$$(x + 9)(x - 1)$$

$$9 +$$

$$(x + 8)(x + 1)$$

$$x = -8 \text{ or } -1$$

$$\frac{8}{81}$$

$$ii) 12x^2 - 5x - 3 = 0$$

$$(12x) (4x - 3)$$

$$(6x - 0.5)(2x - 1)$$

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

$$x = -\frac{3}{4} \text{ or } -\frac{1}{3}$$

$$-0.75 \text{ or } -0.3$$

$$iii) 2x^2 + 17x = -30$$

$$2x^2 + 17x + 30 = 0$$

$$(2x + 15)(x + 2)$$

$$(2x + 5)(x + 6)$$

$$x = -2.5 \text{ or } -6$$

$$iv) x^2 - 256 = 0$$

$$\sqrt{256} = 16$$

$$(x - 16)(x + 16)$$

$$x = 16 \text{ or } -16$$

e) Solve for x

$$(x+5)^2 - x^2 - 32 = (x+1)(x+2) - x^2$$

$$2x^2 + 10x + 25 - x^2 - 32 = x^2 + 3x + 2 - x^2$$

$$10x + 25 - 32 = 3x + 2$$

$$13x = 2 + 32 - 25$$

$$13x = 9$$

$$x = \frac{9}{13} = 0.692$$

Question Three

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a) solve using quadratic formula (2dp)

$$12x^2 = 31x + 15$$

$$12x^2 - 31x - 15 = 0$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = 3 \text{ or } -0.416$$

-0.416 to 2dp = -0.42

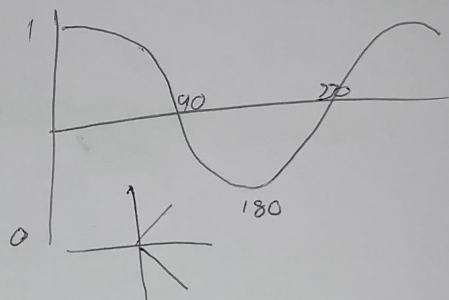
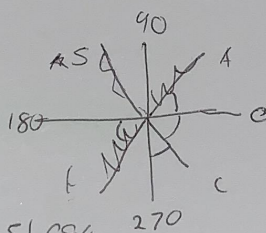
So $x = 3 \text{ or } -0.42$
So x

b) solve for $0 \leq x \leq 360$

i) $\cos x = 0.62$

$$\cos^{-1} 0.62 = x$$

$x = 51.684^\circ$

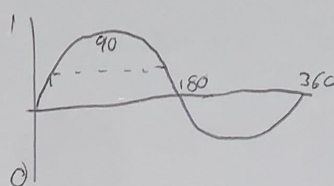


$360 - 51.684 = 308.316^\circ$
 $x = 308.316^\circ$

ii) $7 \sin x = 4$

$$\sin^{-1}\left(\frac{4}{7}\right) = x$$

$x = 34.850^\circ$



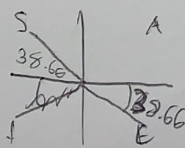
$180 - 34.85 = 145.15^\circ$

$x = 145.15^\circ$

iii) $-5 \tan x = 4$

$$\tan^{-1}\left(\frac{4}{-5}\right) = -38.660^\circ$$

* ignore minus not answer



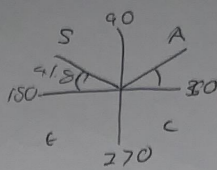
$x = 180 - 38.66 = 141.34^\circ$

$x = 360 - 38.66 = 321.34^\circ$

iv) $-3 \sin x = -2$

$\sin^{-1}\left(\frac{2}{3}\right) = 41.81^\circ$

$180 - 41.81 = 138.19^\circ$



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c) factorise $x^2 + 3x - 10$

$(x+5)(x-2)$

$x = -5 \quad x = 2$

$\tan^2 x + 3 \tan x - 10$

$(\tan x + 5)(\tan x - 2)$

$\tan x = -5 \text{ or } 2$

$\tan^2 x + 3 \tan x - 10$

~~$(\tan - 5)^2 + 3 \tan(5) - 10$~~

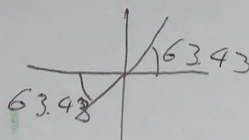
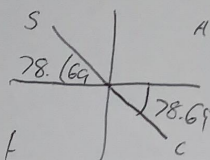
~~$x^2 + 3x - 10 = 0$~~

~~$(x+5)(x-2)$~~

$\tan^{-1}(5) = 78.69^\circ$

(not answer)

$\tan^{-1}(2) = 63.43^\circ$



$180 - 78.69 = 101.31^\circ$

$360 - 78.69 = 281.31^\circ$

$180 + 63.43 = 243.43^\circ$

d) $y = \sin^2\left(\frac{3\theta}{2}\right)$

$2y = \sin^2 3\theta$

$\sin^{-2} 2y = 3\theta$

~~$\sin^{-2}\left(\frac{2y}{3}\right)$~~

$\sin^{-2}\left(\frac{2y}{3}\right) = \theta$

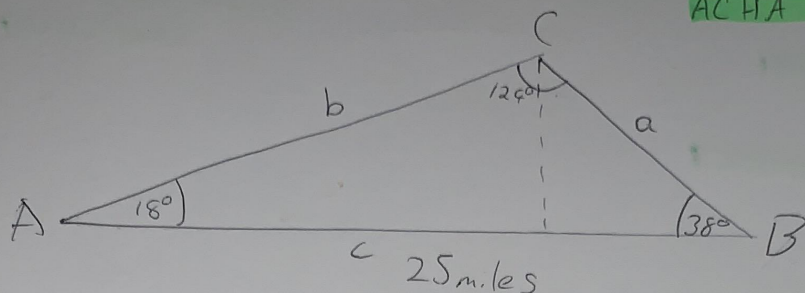
e)

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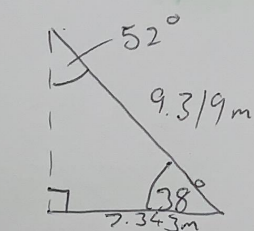
$$180 - 18 - 38 = 124^\circ$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{\sin(18)} = \frac{25}{\sin(124)} \Rightarrow \frac{25}{\sin(124)} \times \sin(18) = a = 9.319 \text{ miles}$$

$$\frac{b}{\sin(38)} = \frac{25}{\sin(124)} \Rightarrow \frac{25}{\sin(124)} \times \sin(38) = b = 18.566 \text{ miles}$$

$$\frac{25}{\sin(124)} \times \sin(38) = b = 18.566 \text{ miles}$$



$$180 - 90 - 38 =$$

$$\frac{9.319}{\sin 90} = \frac{b}{\sin 52}$$

$$\frac{9.319}{\sin(90)} \times \sin(52) = 7.343 \text{ miles}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 9.319^2 + 7.343^2 - (2 \times 9.319 \times 7.343) \cos 38$$

$$a^2 = 120.290$$

$$a = \sqrt{120.290} = 10.968 \text{ miles}$$