

Question 4.

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

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

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

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

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

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

$$12x = 21$$

$$\underline{x = 21}$$

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

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

$$4(4x-1) - 3x = 6(4x+3)$$

$$16x - 4 - 3x = 24x + 18$$

$$13x - 4 = 24x + 18$$

$$-11x = 22$$

$$\underline{x = -2}$$

b) i) $\cos x = 0.62$

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

$x = 51.68^\circ, (360 - 51.68^\circ),$

$x = 51.68^\circ, 308.32^\circ$

ii) $7 \sin x = 4$

$\sin x = \frac{4}{7}$

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

$x = 34.85^\circ, (180 - 34.85^\circ)$

$x = 34.85^\circ, 145.15^\circ$

iii) $-5 \tan x = 4$

$\tan x = (\frac{4}{-5})$

$x = \tan^{-1}(\frac{4}{-5})$

$x = -38.66^\circ, (-38.66 + 180), (-38.66 + 360)$

$x = -38.66^\circ, 141.34^\circ, 321.34^\circ$

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

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

$x = \sin^{-1}(-\frac{2}{3})$

$x = 41.81^\circ, (180 - 41.81)$

$x = 41.81^\circ, 138.19^\circ$

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

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

$\therefore (\tan x - 2)(\tan x + 5) = 0$

$\tan x = 2$

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

$x = 63.43^\circ, 243.43^\circ$

$\tan x = -5$

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

$x = -78.69^\circ, 101.31^\circ, 281.31^\circ$

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

$$(x+1)(x+8) = 0$$

$$\underline{x = -1}$$

$$\underline{x = -8}$$

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

$$(4x-3)(3x+1) = 0$$

$$\underline{x = 3/4}$$

$$\underline{x = -1/3}$$

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

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

$$(2x+5)(x+6) = 0$$

$$x = -5/2$$

$$x = -6$$

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

$$(x+16)(x-16) = 0$$

$$\underline{x = -16}$$

$$\underline{x = +16}$$

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

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

$$x^2 + 5x + 5x + 25 - x^2 - 32 = 3x + 2$$

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

$$7x = 2 + 7$$

$$7x = 9$$

$$x = \frac{9}{7}$$

Question 3

$$a) i) 12x^2 = 31x + 15 \Rightarrow 12x^2 - 31x - 15 = 0$$

$$a = 12$$

$$b = -31$$

$$c = -15$$

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

$$\frac{-(-31) \pm \sqrt{(-31)^2 - 4(12)(-15)}}{2(12)} = \frac{31 \pm \sqrt{1681}}{24}$$

$$\frac{31 + \sqrt{1681}}{24} = \underline{\underline{3.00}}$$

$$\frac{31 - \sqrt{1681}}{24} = \underline{\underline{-0.42}}$$

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

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

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

$$25x^2 + 15x + 15x + 9 = x^2 + 2x + x + 2$$

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

$$a = 24$$

$$b = 27$$

$$c = 7$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \Rightarrow \frac{-(27) \pm \sqrt{(27)^2 - 4(24)(7)}}{2(24)}$$

$$= \frac{-27 \pm \sqrt{57}}{48}$$

$$\therefore \begin{cases} x = -0.41 \\ x = -0.72 \end{cases}$$

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

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

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

$$(x)(0.85) + (x+2)(0.48) = (x-1)(0.70)$$

$$0.85x + 0.48x + 0.96 = 0.70x - 2.8$$

$$1.33x + 0.96 = 0.70x - 2.8$$

$$0.63x = 1.84$$

$$\underline{\underline{x = 2.92}}$$

c) i) ~~$21R^2 + 24R + 5$~~
 ~~$(3x+1)(9x+5)$~~ - ?

ii) $27R^2 + 24R + 5$
 $(3x+1)(9x+5)$

ii) $81Q^2 - 144U^2$
 $9(9Q^2 - 16U^2)$
 $9(3x-4y)(3x+4y)$

iii) $tr \bar{4} + y + ur - uy$
 $r - y(t + u)$

Analytical methods AC+IA 4000
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DORA BOSORHENYI
1900966.

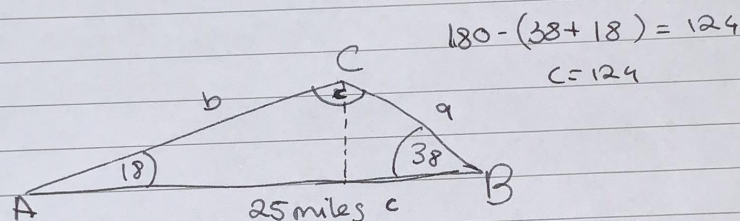
d) $y = \sin^2\left(\frac{3\theta}{2}\right)$

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

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

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

e)



Find AC and AB

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

$$\frac{a}{\sin 18} = \frac{b}{\sin 38} = \frac{25}{\sin 124}$$

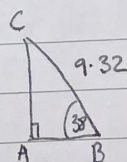
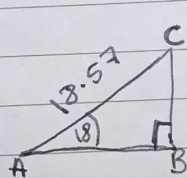
~~$\frac{a}{\sin 18} = \frac{b}{\sin 38} = \frac{25}{\sin 124}$~~

$$b \sin 124 = 25 \sin 38$$

$$b = 18.57 \text{ MILES}$$

$$a \sin 38 = 18.57 \sin 18$$

$$a = 9.32 \text{ miles}$$



$$AB = \cos 38 \times 9.32$$

$$AB = 7.34 \text{ MILES}$$

$$AB = \cos 18 \times 18.57$$

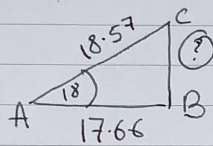
$$AB = 17.66 \text{ MILES}$$

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$$\begin{aligned} AC &= 17.66 \text{ MILES} \\ BC &= 7.34 \text{ MILES} \end{aligned}$$

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DORA BOSZORMENYI
1900965

Altitude of aircraft:



SH

$$O = \sin 18 \times 18.57$$

$$O = \underline{\underline{5.74 \text{ MILES ALTITUDE}}}$$

PA

~~$$\begin{aligned} O &= \sin 18 \times 18.57 \\ O &= 5.74 \text{ miles} \end{aligned}$$~~