

Question Three

a) $12x^2 = -31x + 15$

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

$(12x - 5)(x - 3) = 0$

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

$x = \frac{-(-31) \pm \sqrt{961 + 720}}{24}$

$x = \frac{-(-31) \pm \sqrt{1681}}{24}$

$x = \frac{-(-31) - 41}{24}$

$x = -3$

$x = \frac{-(-31) + 41}{24}$

$x = 3$

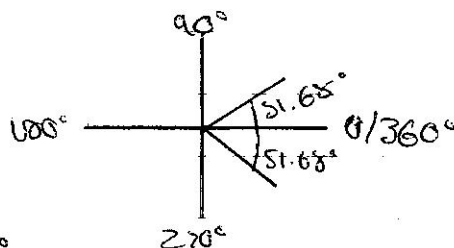
b) i). $\cos x = 0.62$

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

$x = 51.68^\circ$

$360 - 51.68 = 308.32^\circ$

$x = 308.32^\circ$



2). $7 \sin x = 4$

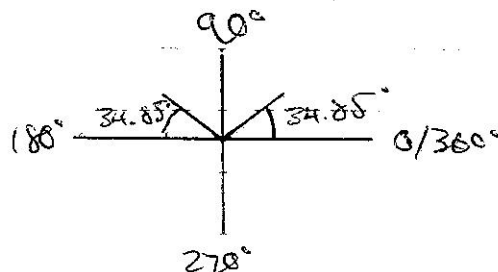
$\sin x = \frac{4}{7}$

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

$x = 34.85^\circ$

$180 - 34.85 = 145.15^\circ$

$x = 145.15^\circ$



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3). $-5 \tan x = 4$

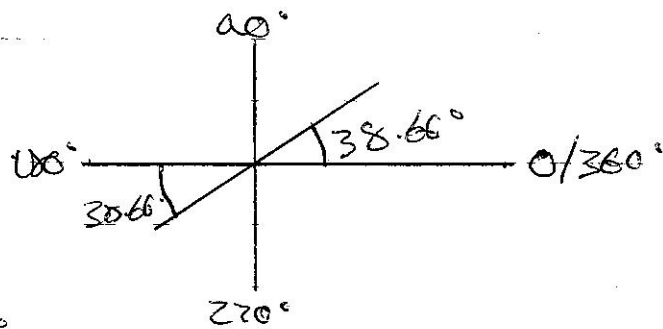
$$\tan x = -\frac{4}{5}$$

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

$$x = -38.66^\circ$$

$$180 + 38.66 = 218.66^\circ$$

$$x = 218.66^\circ$$



4). $-3 \sin x = -2$

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

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

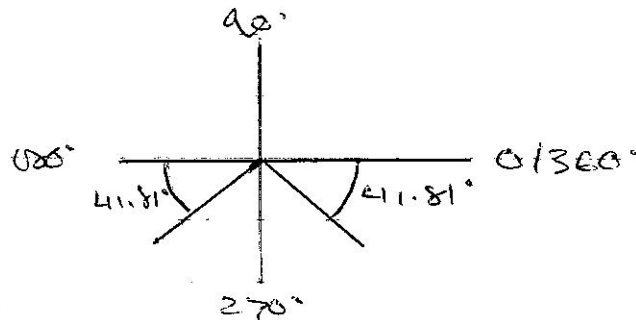
$$x = -41.81^\circ$$

$$180 + 41.81 = 221.81^\circ$$

$$360 - 41.81 = 318.19^\circ$$

$$x = 221.81^\circ$$

$$x = 318.19^\circ$$



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

Checking: $\tan^2 x - 3 \tan x - 10 = 0$ x

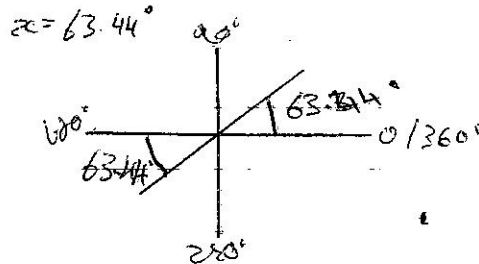
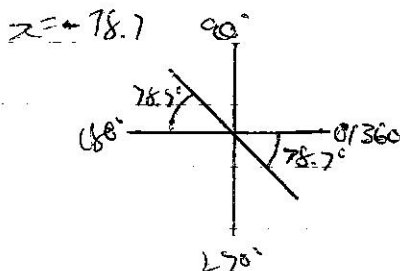
$$(\tan x + 5)(\tan x - 2) = 0$$

Checking: $\tan^2 x + 3 \tan x - 10 = 0$ ✓

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

$$\tan x = -5, \tan x = 2$$

$$x = \tan^{-1}(-5), x = \tan^{-1}(2)$$



$$180 + 63.44 = 243.44$$

$$x = 63.44^\circ$$

$$x = 243.44^\circ$$

$$180 - 78.7 = 101.31^\circ$$

$$360 - 78.7 = 281.31^\circ$$

$$x = 101.31^\circ$$

$$x = 281.31^\circ$$

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Module code:

ACHA4000/ACHA4006

d). $y = \sin^2 \left(\frac{30}{2} \right)$

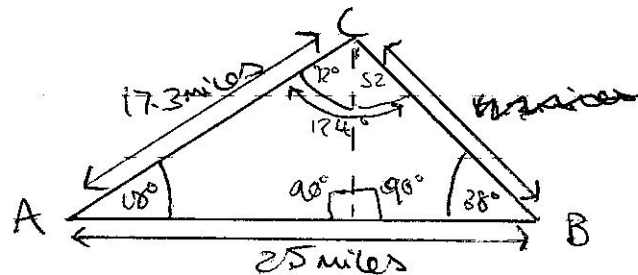
$$\frac{y}{\sin^2} = \frac{30}{2}$$

~~$2y = \sin^2(30)$~~

$$\frac{2y}{\sin^2} = 30$$

$$\frac{2y}{\sin^2(3)} = 0$$

e).



~~18~~ $18 + 90 = 108$

~~180~~ $180 - 108 = 72$

Angle C = 124°

$90 + 38 = 128$

$180 - 128 = 52$

Fact check = $108 + 38 + 124 = 180^\circ$

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

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

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

$$b = \frac{25(\sin 38)}{\sin 124}$$

$$b = \frac{25(0.57)}{0.83}$$

AC
↓
 $b = 17.3 \text{ miles}$

$$BC = \frac{a}{\sin 18} = \frac{17.3}{\sin 38} = \frac{25}{\sin 124}$$

$$a = \frac{17.3(\sin 18)}{\sin 38}$$

$$a = \frac{17.3(0.31)}{0.62}$$

BC
↓
 $a = 8.68 \text{ miles}$

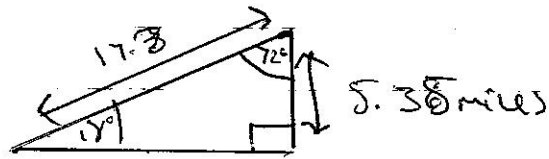
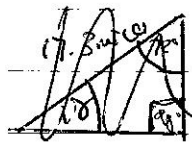
~~Pythagoras = $17.3^2 = a^2 +$~~

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Module code: ACTHAK009
ACMA4006



$$\sin x = \frac{\text{opp}}{\text{hyp}}$$

$$\cos x = \frac{\text{adj}}{\text{hyp}}$$

$$\tan x = \frac{\text{opp}}{\text{adj}}$$

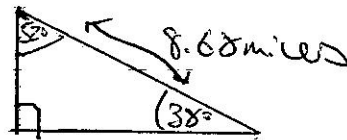
$$\sin 18 = \frac{\text{opp}}{17.3}$$

$$0.31 = \frac{\text{opp}}{17.3}$$

$$0.31 (17.3) = 5.35$$

$$\text{opp} = 5.35 \text{ miles}$$

checking answer =



$$\sin 38 = \frac{\text{opp}}{8.68}$$

$$0.62 (8.68) = 5.35$$

$$\text{opp} = 5.35$$

Aircraft altitude = 5.35 miles

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1). $y = 8x^3 - 2x^2 + x + 10$

$$\frac{dy}{dx} = 24x^2 - 4x + 1$$

2). $y = (5x - 3)(6x - 1)$

$$y = 30x^2 - 23x + 3$$

$$\frac{dy}{dx} = 60x - 23$$

3). $y = \sqrt[3]{x} + \ln x$

$$y = x^{1/3} + \ln x$$

$$\frac{dy}{dx} = \frac{1}{3}x^{-2/3} + \frac{1}{x}$$

4). $y = 5 \sin 2x - 6 \cos 3x - \tan x$

$$y = 5 \sin 2x - 6 \cos 3x - \tan x$$

$$\frac{dy}{dx} = 10 \cos 2x + 18 \sin 3x - \sec^2 x$$

5). $y = e^{7x} \tan 3x$

$$\frac{dy}{dx} = (\tan 3x)(7e^{7x}) + (e^{7x})(3 \sec^2 3x)$$

6). $y = \frac{\sin 2x}{e^{3x}}$

$$\frac{dy}{dx} = \frac{(e^{3x})(2 \cos 2x) - (\sin 2x)(3e^{3x})}{(e^{3x})^2}$$

7/7

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AKT/HK000

b). $y = \sin 2x$

$f' = 2 \cos 2x$

$f'' = -4 \sin 2x$

$f''' = 8 \cos 2x$

$f^{(4)} = 16 \sin 2x$

c). $z = 5x^5 + 3x^3y^2 + 4y^5$

$\frac{\partial z}{\partial x} = 5x^4 + 9x^2y^2$

$\frac{\partial z}{\partial y} = 6x^3y + 20y^4$

$\frac{\partial^2 z}{\partial x^2} = 20x^3 + 18xy^2$

$\frac{\partial^2 z}{\partial y^2} = 6x^3 + 80y^3$

$\frac{\partial^2 z}{\partial y \partial x^2} = 18x^2y$

$\frac{\partial^2 z}{\partial x \partial y^2} = 18x^2y$

d) $y = 3x^2 + 16x + 30$ ①

$\text{②} - \text{①}$

$y = 2x^2 + 4x + 3$ ②

$0 = x^2 + 12x + 27$

$x^2 + 12x + 27 = 0$

$(x+9)(x+3) = 0$

1×27

3×9

Check: $x^2 + 12x + 27 = 0$ ✓

$(x+9)=0, (x+3)=0$

$x = -9, x = -3$

Sub into

②

$y = 2(-9)^2 + 4(-9) + 3$

$y = 162 - 36 + 3$

$y = 129$

$y = 2(-3)^2 + 4(-3) + 3$

$y = 18 - 12 + 3$

$y = 9$

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ACMA400

$$e). y = 5x^2 + 4x - 1$$

$$\frac{dy}{dx} = 10x + 4$$

$$\frac{d^2y}{dx^2} = 10$$

$$6(10) - 5(10x + 4) + 7x - 1 = 39 - 43x$$

$$60 - 50x - 20 + 7x - 1 = 39 - 43x$$

$$39 - 43x = 39 - 43x$$

$$x = 1$$

Question One

1. a)

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

$$-3(8x-3) = 5(-5x+6)$$

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

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

$$35x = -6$$

$$x = \frac{-6}{35}$$

$$x = 0.18$$

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

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

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

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

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

$$-22 = 11x$$

$$x = \frac{-22}{11}$$

$$x = -2$$

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

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

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

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

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

$$x = -27 \pm \frac{\sqrt{(27)^2 - 4(24)(7)}}{2(24)}$$

$$x = -27 \pm \frac{\sqrt{729-672}}{48}$$

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

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Module code: ACMAH001

ACMAH001

$$x = \frac{-27 - 7.55}{48}$$

$$x = \frac{-27 + 7.55}{48}$$

$$x = -0.72$$

$$x = -0.41$$

$$4) 7^x \times \frac{1}{3}^{x+2} = 5^{x-1}$$

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

$$0.85x + 0.47x + 0.98 = 0.7x - 0.7$$

$$0.62x = -0.26$$

$$x = \frac{-0.26}{0.62} \quad x = -0.41$$

4/8

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

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

~~2/2~~

$$x = -8 \quad x = -1$$

$$\cancel{8x^2 + 12x^2 - 5}$$