

Q1) a)

(i) $\frac{8x+1}{6} = \frac{2x+3}{2}$

$$2(8x+1) = 6(2x+3)$$

$$16x+2 = 12x+18$$

$$16x-12x = 18-2$$

$$4x = 16$$

$$x = 4$$

ii) $\frac{x+5}{2} = \frac{x}{4} - \frac{5x-1}{2} \quad \times 4$

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

$$2x+10 = x - 10x + 2$$

$$2x+10 = -9x+2$$

$$11x = -8$$

$$x = \frac{-8}{11} = -0.72$$

iii) $2\ln(x+8) = \ln(x+1) + \ln(x+2)$

$$\ln(x+8)^2 = \ln(x+1)(x+2)$$

$$x^2 + 16x + 64 = x^2 + 3x + 2$$

$$13x = -62$$

$$x = -\frac{62}{13}$$

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

$$\log(2^x \times 3) = \log 5^{x+2}$$

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

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

$$0.30x + 0.48 = 0.70x + 1.40$$

$$0.48 - 1.40 = 0.70x - 0.30x$$

$$-0.92 = 0.40x$$

$$-2.3 = x$$

Q2) a) $14x^2 + 2x - 9 = 0$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(14)(-9)}}{2(14)}$$

$$x = \frac{-2 \pm \sqrt{4 + 504}}{28}$$

$$x = \frac{-2 \pm \sqrt{508}}{28}$$

$$x = \frac{-2 + 22.54}{28}$$

$$x = 0.73$$

$$x = \frac{-2 - 22.54}{28}$$

$$x = -0.88$$

7

~~Q3)~~

b) (i) $(3x+1)(x+4) = 0$

$$x = -\frac{1}{3} \quad x = -4$$

(ii) $(x+8)(x+2) = 0$

$$x = -8 \quad x = -2$$

(iii) $(x+4)(x-4) = 0$

$$x = \pm 4$$

(iv) $(2x+1)(x+3) = 0$

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

10

Q3)

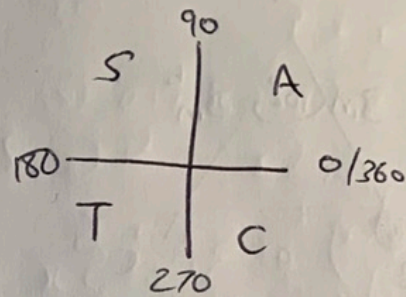
a) $\sin x = 0.6$

$$x = \sin^{-1}(0.6)$$

$$x = 36.87^\circ$$

$$x = 180 - 36.87$$

$$x = 143.13$$



b) $-3 \sin x = 1$

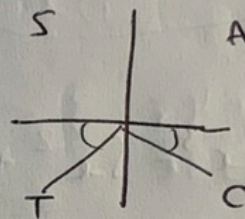
$$\sin x = -\frac{1}{3}$$

Ignore -ve:

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

Not an answer! $\rightarrow x = 19.47^\circ$

draw where $\sin$ is -ve



$$x = 180 + 19.47$$

$$x = 199.47^\circ$$

$$x = 360 - 19.47$$

$$x = 340.53^\circ$$

c) $7 \sin x = 4$

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

$$x = 34.85^\circ$$

$$x = 180 - 34.85$$

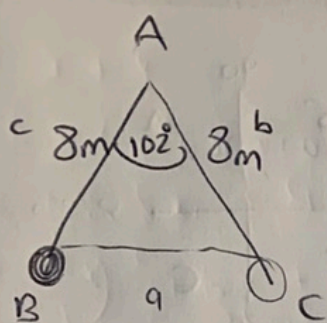
$$x = 145.15^\circ$$

③

④

⑤

b)

Cosine Rule

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

$$(BC)^2 = (8)^2 + (8)^2 - 2(8)(8) \cos 102$$

$$(BC)^2 = 64 + 64 + 26.61$$

$$BC = \sqrt{154.61}$$

$$BC = 12.43m$$

Q4)

a) (i) $y = 3x^3 - 5x^2 + 2x - 3$

$$\frac{dy}{dx} = 9x^2 - 10x + 2$$

(ii) $y = 4(x+2)^2$

$$y = 4(x^2 + 4x + 4)$$

$$y = 4x^2 + 16x + 16$$

$$\frac{dy}{dx} = 8x + 16$$

(iii) $y = \sqrt{x} + \frac{6}{x}$

$$y = x^{0.5} + 6x^{-1}$$

$$\frac{dy}{dx} = 0.5x^{-0.5} - 6x^{-2}$$

$$(iv) \quad y = \sin 5x + 4 \cos 2x + \tan 9x$$

$$\frac{dy}{dx} = 5 \cos 5x - 8 \sin 2x + 9 \sec^2 9x$$

||| ③

$$(v) \quad y = \underset{\uparrow u}{x^4} \underset{\downarrow v}{\sin x} \quad (\text{Product Rule})$$

$$\frac{du}{dx} = 4x^3 \quad \frac{dv}{dx} = \cos x$$

$$\therefore \frac{dy}{dx} = (\sin x)(4x^3) + (x^4)(\cos x)$$

||| ④

$$(vi) \quad y = \frac{x^2 + 4x + 3}{e^{3x}} \leftarrow u \quad (\text{Quotient Rule}) \quad \leftarrow v$$

$$\frac{du}{dx} = 2x + 4 \quad \frac{dv}{dx} = 3e^{3x}$$

$$\therefore \frac{dy}{dx} = \frac{(e^{3x})(2x+4) - (x^2+4x+3)(3e^{3x})}{(e^{3x})^2}$$

||| ⑤

$$(vii) \quad y = (6x^3 - 2x - 1)^6 \quad (\text{Chain Rule})$$

$$\frac{dy}{dx} = 6(6x^3 - 2x - 1)^5 (18x^2 - 2)$$

|| ②

$$b) \quad y = x + 4 \quad (1)$$

$$y = x^2 + 6x + 10 \quad (2)$$

(2) - (1)

$$0 = x^2 + 5x + 6$$

$$0 = (x+2)(x+3)$$

$$x = -2$$

$$y = 2$$

$$x = -3$$

$$y = 1$$

$$c) \quad z = x^2y + x^3 + 2y^2$$

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

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

TOTAL
MARKS : 78