

Max McGowan-Bunting 2104314Question 1

$$a) \quad i) \quad \frac{3x-1}{5} = \frac{6x+5}{9}$$

$$9(3x-1) = 5(6x+5)$$

$$27x - 9 = 30x + 5$$

$$27x - 30x = 5 + 9$$

$$-3x = 14$$

$$x = \frac{14}{-3}$$

$$\underline{\underline{x = -\frac{14}{3}}}$$

$$ii) \quad 1 + \frac{5}{x} = \frac{-6}{x^2}$$

~~$$x^2 + 5x = -6$$~~

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

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

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

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \cdot 1 \cdot 6}}{2 \cdot 1}$$

$$x = \underline{\underline{-2 \text{ or } -3}}$$

$$\text{iii)} \quad 2 \log(3x+1) = \log(x+3) + \log(x+7) \quad (2)$$

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

$$(3x+1)^2 = (x+3)(x+7)$$

$$(3x+1)(3x+1) = (x+3)(x+7)$$

$$9x^2 + 6x + 1 = x^2 + 10x + 21$$

$$8x^2 - 4x - 20 = 0$$

$$x = \frac{4 \pm \sqrt{4^2 - 4 \cdot 8 \cdot -20}}{2 \cdot 8}$$

~~$$x = \frac{4 \pm \sqrt{4^2 - 4 \cdot 8 \cdot -20}}{2 \cdot 8}$$~~

$$x = \frac{1 + \sqrt{41}}{4} = \underline{\underline{1.85}} \quad \text{or} \quad \frac{1 - \sqrt{41}}{4} = \underline{\underline{-1.35}}$$

b

$$\text{i)} \quad 8p^3q^2 - 4p^2q^3 + 2p^3q$$

$$4(p^2q - \quad)(2pq - \quad)$$

$$\text{ii)} \quad x^2 - y^2$$

$$(x - y)(x + y)$$

~~$$x^2 - y^2$$~~

(3)

C

$$i) x^2 + 12x + 20 = 0$$

$$(x + 2)(x + 10)$$

$$x^2 + 10x + 2x + 20$$

$$x = -2 \text{ or } -10$$

$$ii) 2x^2 + 12x + 20 = 0$$

$$(2x \quad)(x \quad)$$

$$iii) x^2 - 400 = 0$$

$$(x + 20)(x - 20)$$

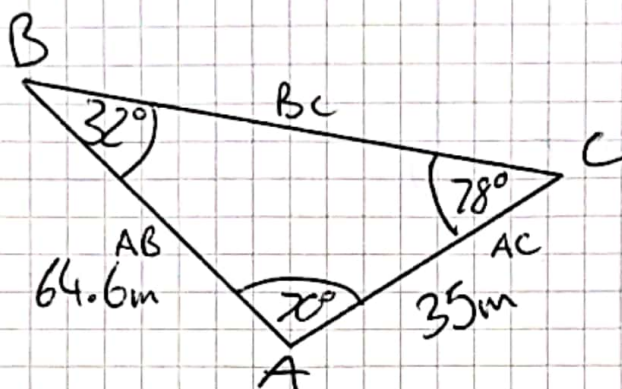
$$x^2 - 20x + 20x - 400 = 0$$

$$x = 20 \text{ or } -20$$

Question 2

④

i)



Angles in triangle add to 180°

~~70 + 32 + C = 180~~
~~180 - 70 + 32 = C~~

$$70 + 32 + C = 180$$

$$180 - 70 + 32 = C$$

$$\underline{\underline{C = 78^\circ}}$$

ii)

$$\frac{AB}{\sin C} = \frac{AC}{\sin B}$$

$$\frac{AB}{\sin 78^\circ} = \frac{35}{\sin 32^\circ}$$

$$35 \sin(78) = AB \sin(32)$$

$$AB = \frac{35 \sin 78}{\sin 32}$$

$$\underline{\underline{AB = 64.60 \text{ m}}}$$

(5)

$$\text{iii)} \quad a^2 = b^2 + c^2 - 2bc \cos(A)$$

~~a = 35~~

~~B = 64~~

$$\text{Ans } a^2 = 35^2 + 64^2 - 2(35 \times 64) \cos(70)$$

$$a = \sqrt{35^2 + 64^2 - 2(35 \times 64) \cos(70)}$$

$$a = \sqrt{5321 - 4522 \cos(70)}$$

$$\text{Ans } a = \underline{\underline{61.44 \text{ m}}}$$

Question 3

a
i)

Question 4

⑥

$$y = 5x^2 + 12x - 14$$

$$y = 4x^2 + 3x - 4$$

$$4x^2 + 3x - 4 = 5x^2 + 12x - 14$$

$$0 = x^2 + 9x - 18$$

$$x = \frac{-9 \pm \sqrt{9^2 - 4 \cdot 1 \cdot -18}}{2 \times 1}$$

$$x = \underline{-0.62 \text{ or } -8.37}$$

$$y = 5(-0.62)^2 + 12(-0.62) - 14 = -19.52$$

$$y = 5(-8.37)^2 + 12(-8.37) - 14 = 235.84$$

$$y = -19.52 \text{ or } 235.84$$

Question 5

7



$$i) (3+7j) + (2-10j) = 5-3j$$

$$ii) (3+7j) - (2-10j) = 1+17j$$

$$iii) \frac{3+7j}{2-10j} =$$

Question 6



a/

$$i) y = 9x^3 + 7x^2 - x + 4$$

$$\frac{dy}{dx} = 27x^2 + 14x - 1$$

$$ii) y = (2x+3)(3x-5)$$

$$y \frac{dy}{dx} = 6x^2 - 10x + 9x - 15$$

$$y = 6x^2 - x - 15$$

$$\frac{dy}{dx} = 12x - 1$$

$$iii) y = 2 \ln x + \frac{5}{x}$$

$$y = 2 \ln x + 5x^{-1}$$

$$\frac{dy}{dx} = \frac{2}{x} - 5x^{-2}$$

$$iv) y = 7 \sin x + 3 \cos 2x + \tan \frac{x}{2}$$

$$\frac{dy}{dx} = 7 \cos x - 6 \sin 2x + \frac{1}{2} \sec^2 \frac{x}{2}$$

Wdya

$$v) y = x^5 \sin 2x$$

⑨ ~~⑩~~ ~~⑪~~

$$u = x^5 \quad u' = 5x^4$$

$$v = \sin 2x \quad v' = 2\cos 2x$$

$$\frac{dy}{dx} = 5x^4 \sin 2x + 2x^5 \cos 2x$$

$$vi) y = \frac{e^{3x}}{x^3}$$

$$u = e^{3x} \quad u' = 3e^{3x}$$

$$v = x^3 \quad v' = 3x^2$$

$$\frac{dy}{dx} = \frac{u'v - v'u}{v^2}$$

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

$$vii) y = (5x^2 - 2x + 1)^5$$

$$u = 5x^2 - 2x + 1 \quad u' = 10x - 2$$

$$v = u^5 \quad v' = 5u^4$$

Question 7

10

a

$$i) \int x^5 + 2x^2 + x - 10 \, dx$$

$$y = \frac{x^6}{6} + \frac{2x^3}{3} + \frac{x^2}{2} - 10x + C$$

$$ii) \int (2x+5)(x^2-1) \, dx$$

$$\int 2x^3 - 2x + 5x^2 - 5 \, dx$$

$$y = \frac{2x^4}{4} - \frac{2x^2}{2} + \frac{5x^3}{3} - 5x + C$$

$$iii) \int_2^5 2x^2(x^2+3) \, dx$$

$$\int_2^5 2x^4 + 6x^2 \, dx$$

$$\left[\frac{2}{5}x^5 + \frac{1}{2}x^3 \right]_2^5 = \frac{2625}{2} - \frac{84}{5} = \underline{\underline{1295.7}}$$

$$\text{iv)} \int 5 \sin 3x - \cos \frac{x}{3} dx$$

⑪



$$-\frac{5}{3} \cos 3x - 3 \sin \frac{x}{3} + C.$$