

Q1

$$(a) \frac{x+4}{x-2} \geq 3 \quad x(x-2)$$

$$(x+4)(x-2) = 3(x-2)$$

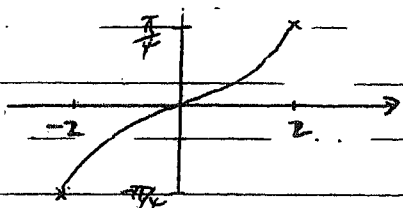
$$x^2 + 2x - 8 = 3x^2 - 12x + 12$$

$$2x^2 - 14x + 20 = 0$$

$$x^2 - 7x + 10 = 0$$

$$(x-2)(x-5) = 0$$

$$x = 2, 5$$

check region $x > 2, x \leq 5$ 

gradients of $y = 2\sqrt{3}x - \sqrt{6}$ and $y = \frac{\sqrt{3}}{7}x + \frac{\sqrt{2}}{7}$ are respectively $m_1 = 2\sqrt{3}, m_2 = \frac{\sqrt{2}}{7}$

$$\tan \alpha = \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$$

$$= \frac{2\sqrt{3} - \frac{\sqrt{2}}{7}}{1 + 2\sqrt{3} \cdot \frac{\sqrt{2}}{7}}$$

$$= \frac{14\sqrt{3} - \sqrt{2}}{7 + 2\sqrt{6}}$$

$$= \frac{18\sqrt{3}}{18}$$

$$\alpha = \tan^{-1} \sqrt{3} = 60^\circ \text{ or } \frac{\pi}{3} \checkmark \checkmark$$

$$(i) \text{ gradient } \frac{dy}{dx} = -3(x-2)^2$$

$$\text{when } x=1 \quad \frac{dy}{dx} = -3$$

$$\text{equation } y-1 = -3(x-1)$$

$$y = -3x + 4$$

$$y\text{-axis where } x=0 \Rightarrow y=4$$

(ii) if P is the point (1,1) A is (0,4)

B is (x, y), ratio 1:3

$$\text{then } (1,1) = \left(\frac{1 \times x_1 + 3 \times 0}{1+3}, \frac{1 \times y_1 + 3 \times 4}{1+3} \right)$$

$$\text{i.e. } \frac{x_1}{4} = 1 \quad \frac{y_1 + 12}{4} = 1$$

$$x_1 = 4 \quad y_1 = -8$$

 \therefore B is the point (4, -8)(iii) (4, -8) must satisfy $y = -(x-2)^3$

$$\text{if } x=4, y = -(4-2)^3 = -8 \checkmark$$