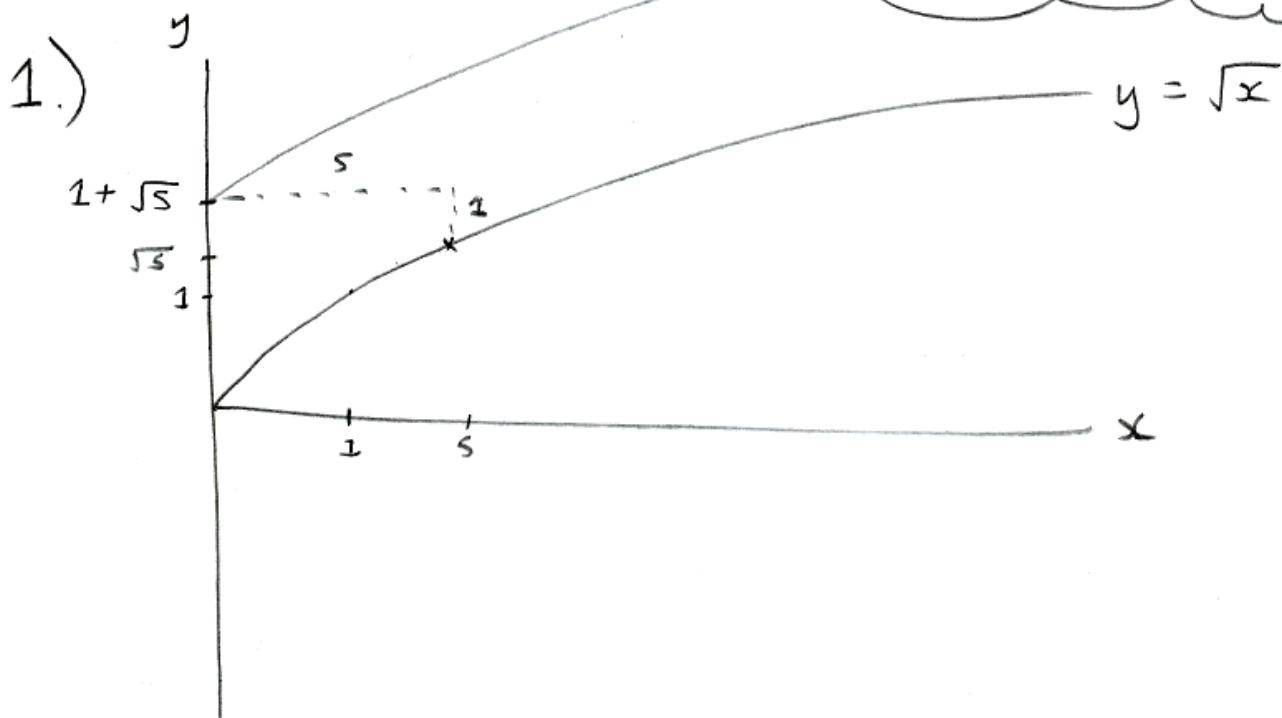
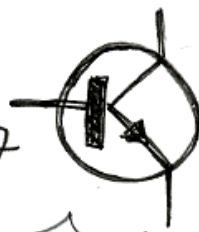


Practice AS-Level Mathematics Test

$$y-1 = \sqrt{x+5}$$

JDGM

18/XI/'17



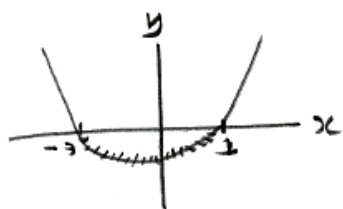
$y \rightarrow y-1$ is a shift by $+1$ in the y -direction.

$x \rightarrow x+5$ is a shift by -5 in the x -direction.

The vector is $\begin{pmatrix} -5 \\ 1 \end{pmatrix}$.

$$2) 7 - x^2 - 2x > 4 \Rightarrow 0 > x^2 + 2x - 3$$

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



$$\therefore \begin{matrix} x > -3 \\ x < 1 \end{matrix}$$

$$\left. \begin{matrix} x > -3 \\ x < 1 \end{matrix} \right\} -3 < x < 1$$

$$3.) i.) \sqrt{3} = 3^{1/2} \therefore \boxed{p = 1/2}$$

$$ii.) \frac{1}{9} = \frac{1}{3^2} = 3^{-2} \therefore \boxed{q = -2}$$

$$iii.) \sqrt{3} \times 3^x = 3^{x+1/2} = \frac{1}{9} = 3^{-2}$$

$$\therefore x + 1/2 = -2$$

$$\boxed{x = -2^{1/2}}$$

$$4.) \frac{5\sqrt{2} + 2}{3\sqrt{2} + 4} = \frac{(5\sqrt{2} + 2)(3\sqrt{2} - 4)}{(3\sqrt{2} + 4)(3\sqrt{2} - 4)}$$

$$= \frac{15 \cdot 2 - 20\sqrt{2} + 6\sqrt{2} - 8}{9 \cdot 2 - 16} = \frac{(30 - 8) + (6 - 20)\sqrt{2}}{18 - 16}$$

$$= \frac{22 - 14\sqrt{2}}{2} = \boxed{11 - 7\sqrt{2}}$$

$$5.) (2 + 3x)^6 = \dots + \underbrace{\binom{6}{3} 2^3 (3x)^3}_{20 \cdot 8 \cdot 27 \cdot x^3} + \dots$$

$$\triangleright 20 \cdot 8 \cdot 27 \cdot x^3 = 4320x^3$$

$$\boxed{\text{Answer} = 4320}$$

$$6.) i) y - -5 = 2(x - 4)$$

$$y + 5 = 2x - 8$$

$$\boxed{y = 2x - 13}$$

$$ii) 3x - y = 4 \Rightarrow y = 3x - 4$$

$$m_1 m_2 = -1$$

$$3m_2 = -1$$

$$m_2 = -\frac{1}{3}$$

$$l_2: y - 0 = -\frac{1}{3}(x - 3)$$

$$\boxed{y = -\frac{1}{3}x + 1}$$

iii.) Solve simultaneously.

$$2x - 13 = -\frac{1}{3}x + 1$$

$$6x - 39 = -x + 3$$

$$7x = 42$$

$$x = 6$$

$$y = -\frac{1}{3}6 + 1 = -2 + 1 = -1$$

l_1 intersects l_2 at $\boxed{(6, -1)}$

$$7.) i) f(x) = x^{3/2} - 8x^{-1/2}$$

$$f(3) = 3^{3/2} - 8(3^{-1/2})$$

$$= 3\sqrt{3} - 8\left(\frac{1}{\sqrt{3}}\right)$$

$$= 3\sqrt{3} - \frac{8\sqrt{3}}{3}$$

$$= \left(3 - \frac{8}{3}\right)\sqrt{3}$$

$$= \frac{9-8}{3}\sqrt{3} = \frac{1}{3}\sqrt{3} = \boxed{\frac{\sqrt{3}}{3}}$$

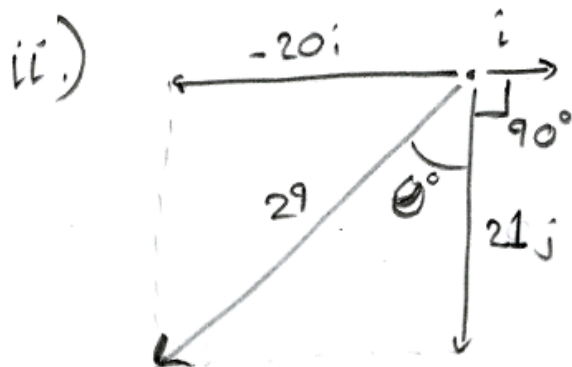
$$ii.) f(x) = 0 = x^{3/2} - 8x^{-1/2}$$

$$\Rightarrow x^{3/2} = 8x^{-1/2} \quad (\times x^{1/2})$$

$$x^2 = 8$$

$$\boxed{x = \pm 2\sqrt{2}}$$

$$8.) i.) \sqrt{20^2 + 21^2} = \sqrt{841} = \boxed{29}$$



$$\theta^\circ = \cos^{-1}\left(\frac{21}{29}\right) = 43.6^\circ$$

Angle between i and $-20i + 21j$ is $\boxed{133.6^\circ}$

$$9.) i.) t_2 = kt_1 - 7 = \boxed{3k - 7}$$

$$t_3 = kt_2 - 7 = k(3k - 7) - 7$$

$$= \boxed{3k^2 - 7k - 7}$$

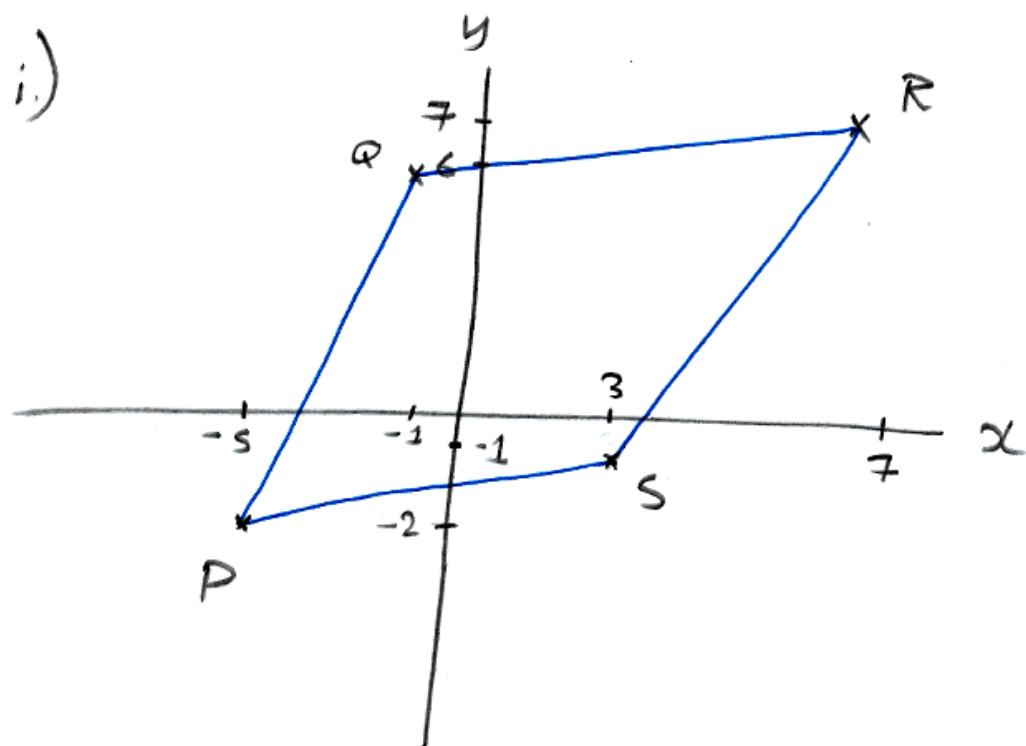
$$ii.) t_3 = 3k^2 - 7k - 7 = 13$$

$$3k^2 - 7k - 20 = 0$$

$$(3k + 5)(k - 4) = 0$$

$$\boxed{k = 4 \text{ or } -5/3}$$

10.) i.)



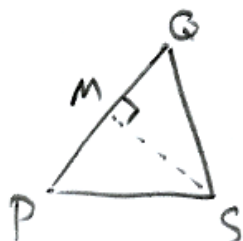
$$\begin{aligned}
 \text{ii.) } PQ &= \sqrt{(-5 - -1)^2 + (-2 - 6)^2} = \sqrt{(-4)^2 + (-8)^2} \\
 &= \sqrt{16 + 64} = \sqrt{80} = \sqrt{16} \sqrt{5} \\
 &= \boxed{4\sqrt{5}}
 \end{aligned}$$

$$\begin{aligned}
 \text{iii.) } M &= \left(\frac{1}{2}(-5 + -1), \frac{1}{2}(-2 + 6) \right) \\
 &= \left(\frac{1}{2}(-6), \frac{1}{2}(4) \right) = \boxed{(-3, 2)}
 \end{aligned}$$

$$\begin{aligned}
 \text{iv.) } \vec{MS} &= 6i - 3j & (3 - -3)i + (-1 - 2)j \\
 \vec{PQ} &= 4i + 8j & \\
 m_1 &= \frac{-3}{6} = -\frac{1}{2} \\
 m_2 &= \frac{8}{4} = 2 \\
 m_1 m_2 &= -\frac{1}{2} \times 2 = -1
 \end{aligned}$$

\therefore Perpendicular

$$\text{v.) } \begin{array}{c} \text{Q} \quad \text{R} \\ \diagdown \quad \diagup \\ \text{P} \quad \text{S} \end{array} = \begin{array}{c} \text{Q} \\ \diagdown \quad \diagup \\ \text{P} \quad \text{S} \end{array} + \begin{array}{c} \text{Q} \quad \text{R} \\ \diagdown \quad \diagup \\ \text{S} \end{array} = 2 \times \begin{array}{c} \text{Q} \\ \diagdown \quad \diagup \\ \text{P} \quad \text{S} \end{array}$$



$$|PQ| = 4\sqrt{5}$$

$$|MS| = \sqrt{36 + 9} = \sqrt{45} = 3\sqrt{5}$$

$$\therefore \text{Area } PQS = \frac{1}{2} \cdot 4\sqrt{5} \cdot 3\sqrt{5} = 30$$

$$2 \times \text{Area } PQS = \boxed{60}$$