

$$\text{i:)} \quad (3\sqrt{6})^6 = (6^{1/3})^6 = 6^{1/3 \times 6} = 6^2 = \underline{\underline{36}}$$

$$\begin{aligned}\text{ii:)} \quad & \frac{3y^4 \times (10y)^3}{2y^5} = \frac{3y^4 \times 10^3 y^3}{2y^5} \\ & = \frac{3y^4 \times 1000y^3}{2y^5} \\ & = \frac{3000y^7}{2y^5} \\ & = 1500y^2\end{aligned}$$

$$\text{2:)} \quad kx^2 - 4x + k$$

$$\begin{aligned}b^2 - 4ac &= (-4)^2 - 4(k)(k) \\ &= 16 - 4k^2\end{aligned}$$

$$\text{ii)} \quad kx^2 - 4x + k = 0$$

equal roots \therefore discriminant = 0

$$16 - 4k^2 = 0$$

$$16 = 4k^2$$

$$k^2 = 4$$

$$\underline{\underline{k = \pm 4.}}$$

3)

$$x + 2y - 6 = 0$$

$$2x^2 + y^2 = 57$$

$$x = 6 - 2y$$

$$2(6-2y)^2 + y^2 = 57$$

$$2(36 - 24y + 4y^2) + y^2 = 57$$

$$72 - 48y + 8y^2 + y^2 = 57$$

$$9y^2 - 48y + 72 - 57 = 0$$

$$9y^2 - 48y + 15 = 0 \quad (\div 3)$$

$$3y^2 - 16y + 5 = 0$$

$$(3y - 1)(y - 5) = 0$$

$$y = \frac{1}{3} \quad \text{or} \quad y = 5$$

$$x = 6 - 2y$$

$$\text{when } y = \frac{1}{3}$$

$$x = 6 - \frac{2}{3} = \frac{18}{3} - \frac{2}{3} = \frac{16}{3}$$

$$\text{when } y = 5$$

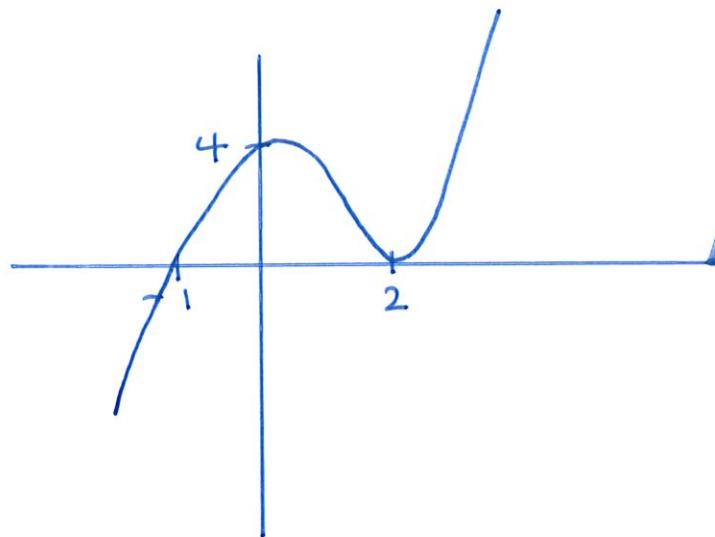
$$\begin{aligned} x &= 6 - 2 \times 5 \\ &= -4 \end{aligned}$$

$$\text{so } x = \frac{16}{3} \quad y = \frac{1}{3}$$

$$\text{or } x = -4 \quad y = 5$$

$$\begin{aligned}
 4i) \quad & (x-2)^2(x+1) \\
 = & (x^2 - 4x + 4)(x+1) \\
 = & \underline{\begin{array}{r} x^3 + x^2 \\ - 4x^2 - 4x \\ \hline + 4x + 4 \end{array}} \\
 & \underline{x^3 - 3x^2 + 4}
 \end{aligned}$$

ii)



$$5i) \quad A(4,5) \quad B(p,q) \quad M(-1,3)$$

$$\left(\frac{4+p}{2}, \frac{5+q}{2} \right) = (-1, 3)$$

$$\text{so } \frac{4+p}{2} = -1 \quad \text{and} \quad \frac{5+q}{2} = 3$$

$$4+p = -2$$

$$\underline{p = -6}$$

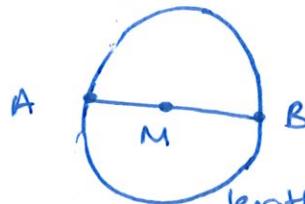
$$5+q = 6$$

$$\underline{q = 1}$$

$$\therefore B(-6, 1)$$

A(4,5)

5ii)



M is the centre (-1, 3)

we need to find the radius:

$$\text{length of } MA^2: (4 - -1)^2 + (5 - 3)^2$$

$$= 25 + 4$$

$$= 29$$

$$\therefore r^2 = 29, \text{ radius} = \sqrt{29}$$

iii)

eqn of circle is

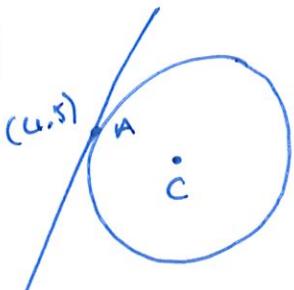
$$(x+1)^2 + (y-3)^2 = 29.$$

$$x^2 + 2x + 1 + y^2 - 6y + 9 - 29 = 0$$

$$x^2 + y^2 + 2x - 6y + 10 - 29 = 0$$

$$x^2 + y^2 + 2x - 6y - 19 = 0.$$

iv)



gradient of AC

A(4,5) C(-1,3)

$$\text{grad} = \frac{3-5}{-1-4} = \frac{-2}{-5} = \frac{2}{5}$$

\therefore grad of tangent line is $-\frac{5}{2}$

$$y - y_1 = m(x - x_1)$$

$$y - 5 = -\frac{5}{2}(x - 4)$$

$$8y - 40 = -5x + 20$$

$$5x + 8y - 60 = 0$$

$$\left(\text{or } y = -\frac{5}{8}x + \frac{15}{2}\right)$$

using
(4,5)

6)

$$4x^2 + y^2 = 10$$

$$2x - y = 4$$

$$y = 2x - 4$$

$$4x^2 + (2x - 4)^2 = 10$$

$$4x^2 + 4x^2 - 16x + 16 = 10$$

$$8x^2 - 16x + 6 = 0 \quad (\div 2)$$

$$4x^2 - 8x + 3 = 0$$

$$(2x - 3)(2x - 1) = 0$$

$$x = \frac{3}{2} \quad \text{or} \quad x = \frac{1}{2}$$

when $x = \frac{3}{2}$

$$y = 2\left(\frac{3}{2}\right) - 4$$

$$y = -1$$

when $x = \frac{1}{2}$

$$y = 2\left(\frac{1}{2}\right) - 4$$

$$y = -3$$

so $x = \frac{1}{2}, y = -3$

$$x = \frac{3}{2}, y = -1$$

T: A (2, 7) B (-1, -2)

gradient of line is 4

$$y - 7 = 4(x - 2)$$

$$y - 7 = 4x - 8$$

$$y = 4x - 1$$

$$\text{ii) } A(2,7) \quad B(-1,-2)$$

$$\begin{aligned}\text{length } AB &= \sqrt{(2-(-1))^2 + (7-(-2))^2} \\ &= \sqrt{3^2 + 9^2} \\ &= \sqrt{90} \\ &= \sqrt{9 \times 10} \\ &= 3\sqrt{10}\end{aligned}$$

iii)

$$M: \left(\frac{2-1}{2}, \frac{7-2}{2}\right) = \left(\frac{1}{2}, \frac{5}{2}\right)$$

gradient of AB :

$$\frac{-2-7}{-1-2} = \frac{-9}{-3} = 3$$

$$\therefore \text{perp grad} = -\frac{1}{3}$$

eqn of line: $y - \frac{5}{2} = -\frac{1}{3}(x - \frac{1}{2}) \quad (\times 3)$

$$3y - \frac{15}{2} = -x + \frac{1}{2} \quad (\times 2)$$

$$6y - 15 = -2x + 1$$

$$2x + 6y - 16 = 0$$

$$x + 3y - 8 = 0$$

8i)

$$4x - 3y + 5 = 0$$

$$4x + 5 = 3y$$

$$3y = 4x + 5$$

$$y = \frac{4}{3}x + \frac{5}{3}$$

$$\therefore \text{gradient} = \frac{4}{3}$$

8ii) (1, 2)

$$\text{gradient} = -\frac{3}{4}$$

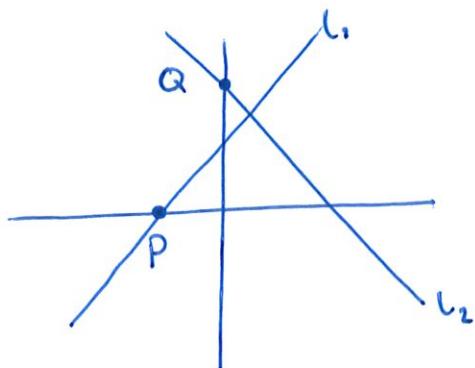
$$y - 2 = -\frac{3}{4}(x - 1)$$

$$4y - 8 = -3x + 3$$

$$3x + 4y - 8 - 3 = 0$$

$$3x + 4y - 11 = 0$$

iii)



Find P.

$$l_1 : 4x - 3y + 5 = 0$$

$$\text{At } P, y = 0$$

$$4x - 0 + 5 = 0$$

$$4x = -5$$

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

$$\text{so } P : \left(-\frac{5}{4}, 0\right)$$

Find Q.

Q is the y-intercept of l_2 (when $x=0$)

$$l_2 : 3x + 4y - 11 = 0$$

$$0 + 4y - 11 = 0$$

$$4y = 11$$

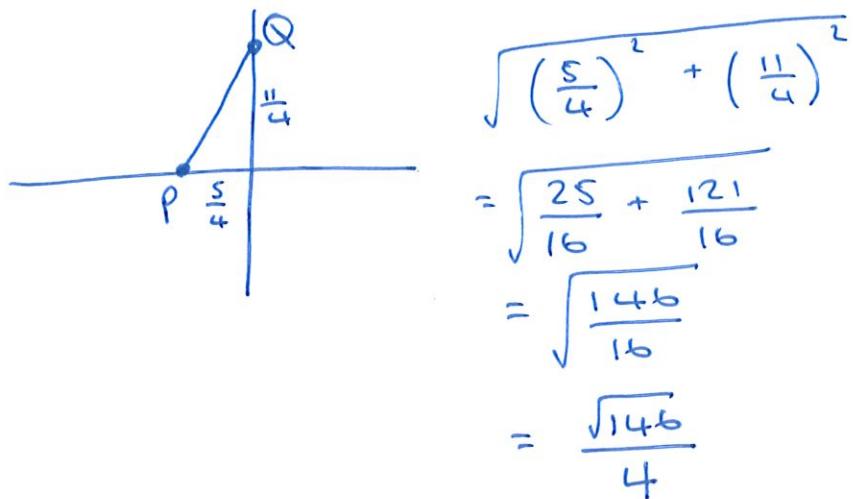
$$y = \frac{11}{4}$$

$$Q : \left(0, \frac{11}{4}\right)$$

$$\therefore \text{midpoint of } PQ \text{ is } \left(\frac{-\frac{5}{4}+0}{2}, \frac{0+\frac{11}{4}}{2}\right) = \left(-\frac{5}{8}, \frac{11}{8}\right)$$

iv) length of PQ .

$$P\left(-\frac{5}{4}, 0\right) \quad Q\left(0, \frac{11}{4}\right)$$



9.) $\widehat{(x-5)(x+2)}(x+5)$

$$(x^2 + 2x - 5x - 10)(x+5)$$

$$\widehat{(x^2 - 3x - 10)}(x+5)$$

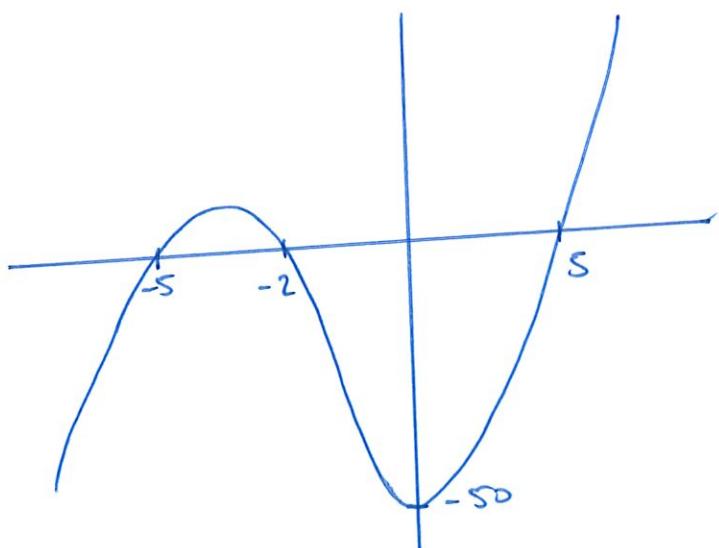
$$x^3 + 5x^2$$

$$-3x^2 - 15x$$

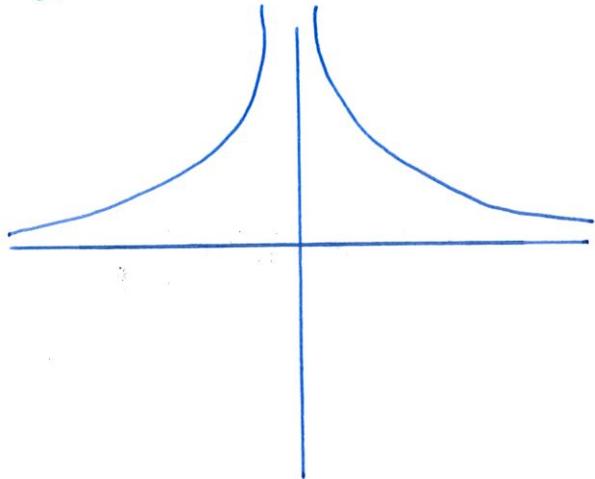
$$\begin{array}{r} -10x - 50 \\ \hline \end{array}$$

$$\begin{array}{r} x^3 + 2x^2 - 25x - 50 . \\ \hline \end{array}$$

ii) intercepts. $x = 5, x = -2, x = -5$
y intercept $y = -50$.



$$10.) \quad y = \frac{1}{x^2}$$



$$\text{ii}) \quad y = \frac{1}{(x+3)^2}$$

$$\text{iii}) \quad y = \frac{1}{x^2} \rightarrow y = \frac{4}{x^2}$$

$$Q: (1, 4)$$

$$\text{ii:}) \quad \frac{12}{3+\sqrt{5}} \times \frac{3-\sqrt{5}}{3-\sqrt{5}}$$

$$= \frac{12(3-\sqrt{5})}{3^2 - 5} = \frac{12(3-\sqrt{5})}{4}$$

$$= 3(3-\sqrt{5})$$

$$= 9 - 3\sqrt{5}$$

$$\text{ii}) \quad \sqrt{18} - \sqrt{2}$$

$$= \sqrt{9 \times 2} - \sqrt{2}$$

$$= 3\sqrt{2} - \sqrt{2}$$

$$= \underline{2\sqrt{2}}$$

$$12) \quad \frac{8+\sqrt{7}}{2+\sqrt{7}} \times \frac{2-\sqrt{7}}{2-\sqrt{7}}$$

$$= \frac{(8+\sqrt{7})(2-\sqrt{7})}{4-7}$$

$$= \frac{16 - 8\sqrt{7} + 2\sqrt{7} - 7}{-3}$$

$$= \frac{9 - 6\sqrt{7}}{-3}$$

$$= \underline{-3 + 2\sqrt{7}}.$$