



$$\textcircled{a} \quad y = x^2 + 3x - \textcircled{1} \quad (1, 4)$$

$$\frac{dy}{dx} = 2x + 3$$

so at $x = 1$;

$$\frac{dy}{dx} = 2 \times 1 + 3$$
$$dx = 5$$

~~put $x = 5$ into $\textcircled{1}$ to get y~~

~~$$y = 5^2 + 3 \times 5$$~~

~~$$y = 25 + 15$$~~

~~$$y = 40$$~~

Using Point gradient formula to get the equation

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

$$y - 4 = 5(x - 1)$$

$$y - 4 = 5x - 5$$

$$y = 5x - 1$$

~~$$y = 5x - 1 - y = 0$$~~



$$\textcircled{b} \frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

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

$$\frac{y - 5}{x + 2} = \frac{-2}{6}$$

$$\frac{y - 5}{x + 2} = -\frac{1}{3}$$

$$y - 5 = -\frac{1}{3}(x + 2)$$

$$y - 5 = -\frac{1}{3}x - \frac{2}{3}$$

$$3y - 15 = -x - 2$$

$$\therefore x + 3y - 13 = 0$$

$$\textcircled{ii} \text{ Distance form } \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$AB = \sqrt{(4 - -2)^2 + (3 - 5)^2}$$

$$AB = \sqrt{(6)^2 + (-2)^2}$$

$$AB = \sqrt{40}$$

$$= \sqrt{4} \times \sqrt{10}$$

$$= 2\sqrt{10}$$

(ii)

Perpendicular

$$\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

$$x_1 = 0 - 2$$

$$y_1 = 0 - 5$$

$$a = 1$$

$$b = 3$$

$$c = -13$$

$$= \frac{|1 \times 0 + 3 \times 0 + -13|}{\sqrt{1^2 + 3^2}}$$

$$= \frac{|-13|}{\sqrt{1^2 + 3^2}}$$

$$= \frac{13}{\sqrt{10}}$$

$$= \frac{13}{\sqrt{10}}$$

* Area of Parallelogram

$$= 1 \quad x_1 = 0 \quad y_1 = 0$$

$$a = 1 \quad b = 3 \quad c = -13$$

$$= \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

$$= \frac{|1 \times 0 + 3 \times 0 + -13|}{\sqrt{1^2 + 3^2}}$$

$$= \frac{|-13|}{\sqrt{10}}$$

$$= \frac{13}{\sqrt{10}} \rightarrow \text{rationalise} \quad \frac{13}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}}$$

$$= \frac{13\sqrt{10}}{10}$$

(iv) Area of parallelogram = $\frac{1}{2} Ah$

$$= \frac{2\sqrt{10} \times 13\sqrt{10} \times 1}{1 \times 10 \times 2}$$

$$= \left(\frac{26\sqrt{10}}{10} \right) \frac{1}{2} \text{ units}^2$$

(v) $\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

BC \rightarrow need

Gradient of AO = $\frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{0 - 5}{0 - -2}$$

$$= \frac{-5}{2}$$

∴ BC gradient is $-\frac{5}{2}$ because parallel lines have the same gradient

Use point gradient 2 and equation of line BC 2 use 4 perpendicular distance

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

$$y - 3 = -\frac{5}{2}(x - 4)$$

$$y - 3 = -\frac{5}{2}x + 10$$

$$2y - 6 = -5x + 20$$

$$2y + 5x - 26 = 0$$

Perpendicular $x=0, y=0$
 $a=1, b=2, c=-26$

$$\frac{|1 \times 0 + 2 \times 0 + (-26)|}{\sqrt{1^2 + 2^2}}$$

$$= \frac{|-26|}{\sqrt{5}} = \frac{26}{\sqrt{5}}$$