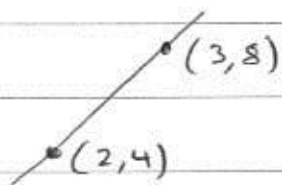


Exercise D

①

(a)

$$m = \frac{8-4}{3-2} \\ = 4$$



$$m=4, (2,4)$$

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

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

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

$$\underline{\underline{y = 4x - 4}}$$

$$m=4, (7,5)$$

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

$$y-5 = 4(x-7)$$

$$y-5 = 4x-28$$

$$\underline{\underline{y = 4x - 23}}$$

$$(b) \quad m = \frac{5-2}{3-0} = 1$$

$m=1, (0,2) \rightarrow$  This tells that the y-intercept is 2.

$$\therefore c=2$$

$$\underline{\underline{y = x + 2}}$$

$$(c) \quad m = \frac{8-0}{2-(-2)} = \frac{8}{4} = 2$$

$$m=2, (-2,0)$$

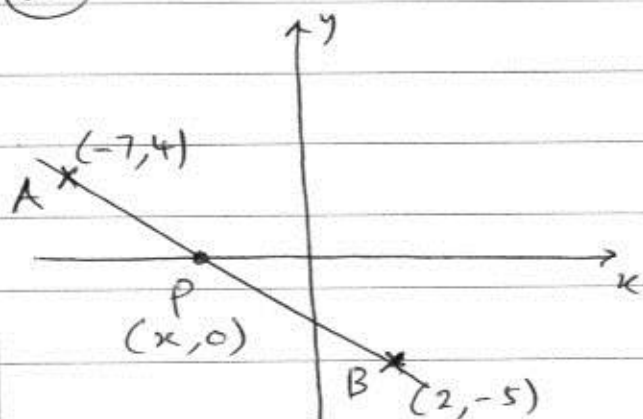
$$y-y_1 = m(x-x_1)$$

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

$$\underline{\underline{y = 2x + 4}}$$

$$(d) \quad m = \frac{5-(-3)}{7-5} = \frac{8}{2} = 4$$

②

Method 1

Find the equation of line AB. Then sub  $y=0$  to find the x coordinate of P.

Method 2 (Faster)

Let the coordinates of P be  $(x, 0)$ .

Gradient of AP = Gradient of ~~AB~~ <sup>AB</sup>

$$\frac{4-0}{-7-x} = \frac{4-(-5)}{-7-2}$$

$$\frac{4}{-7-x} = \frac{9}{-9}$$

$$\frac{4}{-7-x} = -1$$

$$4 = -1(-7-x)$$

$$4 = 7+x$$

$$x = -3$$

$$\therefore P \rightarrow \underline{\underline{(-3, 0)}}$$

$$y - 9 = -8$$

$$y = 1$$

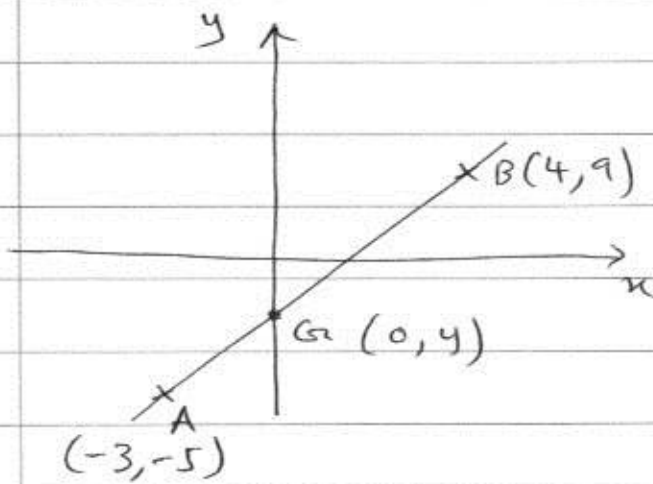
$$\therefore G \rightarrow (0, 1)$$

[This shows that my sketch is not correct as the y-intercept on my sketch appears to be negative.

But that's ok ~~is~~.

The purpose of a sketch is to understand the question. It doesn't need to be accurate.]

(3)



Method 1:

Find the equation of line AB. Then from that equation you can find its y-intercept.

Method 2:

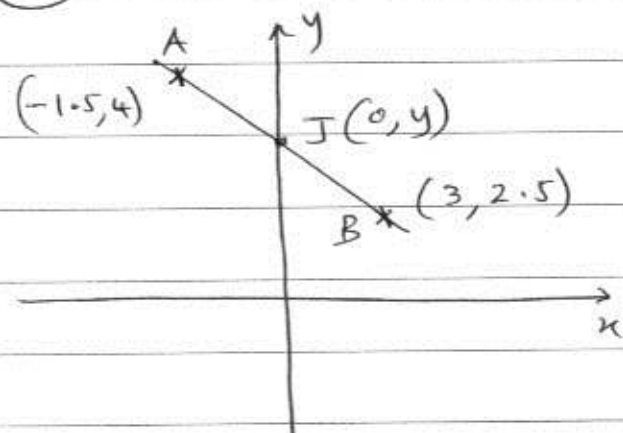
$$\text{Let } G \rightarrow (0, y)$$

$$m_{BG} = m_{AB}$$

$$\frac{y-9}{0-4} = \frac{9-(-5)}{4-(-3)}$$

$$\frac{y-9}{-4} = 2$$

(4)



$$m_{AJ} = m_{AB}$$

$$\frac{y-4}{0-(-1.5)} = \frac{4-2.5}{-1.5-3}$$

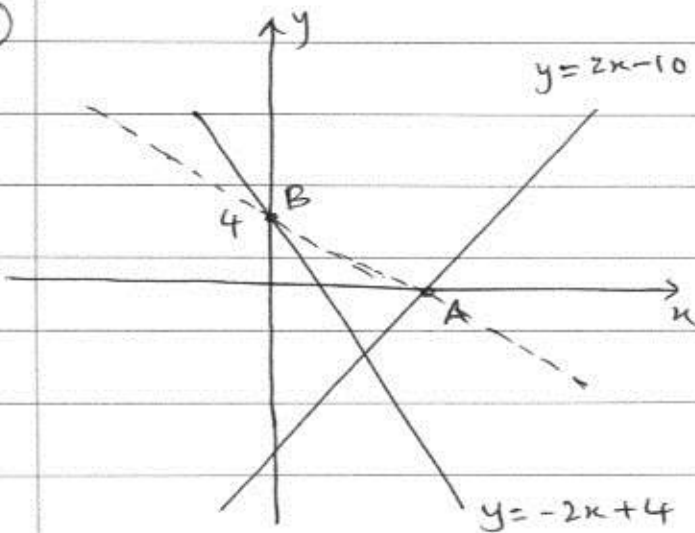
$$\frac{y-4}{1.5} = \frac{1.5}{-4.5}$$

$$y-4 = \frac{1.5}{-3}$$

$$y = 3.5$$

$$\therefore J \rightarrow \underline{\underline{(0, 3.5)}}$$

5



$$B \rightarrow (0, 4)$$

Coordinates of A:

$$\begin{aligned} \text{sub } y=0, \\ y &= 2x - 10 \\ 0 &= 2x - 10 \end{aligned}$$

$$x = 5$$

$$A \rightarrow (5, 0)$$

$$m_{AB} = \frac{0-4}{5-0} = -\frac{4}{5}$$

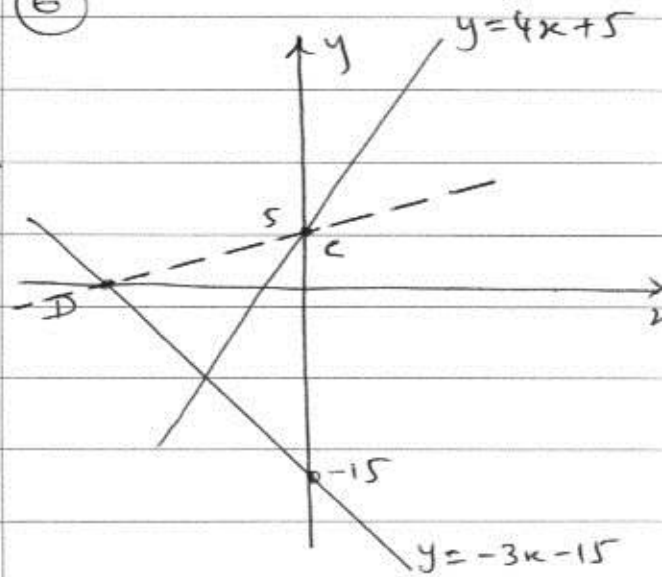
Equation of line AB:

$$\begin{aligned} m &= -\frac{4}{5}, \quad (5, 0) \\ y - y_1 &= m(x - x_1) \end{aligned}$$

$$y - 0 = \frac{-4}{5}(x - 5)$$

$$\underline{\underline{y = -\frac{4}{5}x + 4}}$$

6



$$C \rightarrow (0, 5)$$

Coordinates of D:

$$\begin{aligned} \text{sub } y=0 \\ y &= -3x - 15 \\ 0 &= -3x - 15 \\ 3x &= -15 \\ x &= -5 \end{aligned}$$

$$D \rightarrow (-5, 0)$$

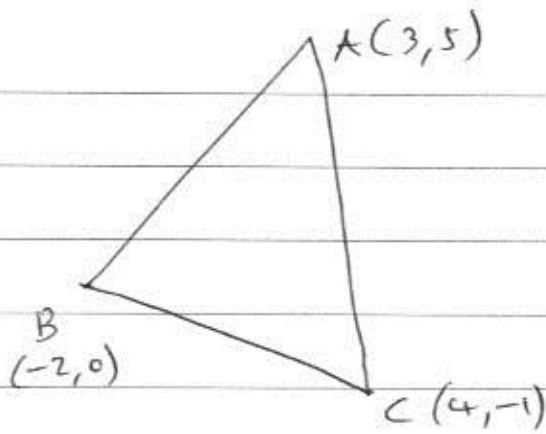
$$m_{CD} = \frac{0-5}{-5-0} = 1$$

Equation of CD:

$$\begin{aligned} m &= 1, \quad y\text{-intercept} = 5 \\ y &= x + 5 \\ \underline{\underline{x - y + 5 = 0}} \end{aligned}$$



9



$$m_{AB} = \frac{5-0}{3-(-2)} = 1$$

Equation of AB:

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

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

$$\underline{y = x + 2}$$

$$m_{BC} = \frac{0 - (-1)}{-2 - 4} = -\frac{1}{6}$$

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

$$y - 0 = -\frac{1}{6}(x - (-2))$$

$$\underline{\underline{y = -\frac{1}{6}x - \frac{1}{3}}}$$

$$m_{AC} = \frac{5 - (-1)}{3 - 4} = -6$$

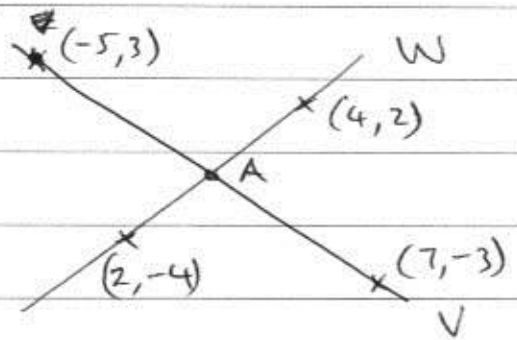
$$y - y_1 = m(x - x_1)$$

$$y - (-1) = -6(x - 4)$$

$$y + 1 = -6x + 24$$

$$\underline{\underline{y = -6x + 23}}$$

10



$$m_V = \frac{3 - (-3)}{-5 - 7} = -\frac{1}{2}$$

Equation of line V:

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

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

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

$$\boxed{y = -\frac{1}{2}x + \frac{1}{2}} \quad \text{--- (1)}$$

$$m_W = \frac{2 - (-4)}{4 - 2} = 3$$

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

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

$$\boxed{y = 3x - 10} \quad \text{--- (2)}$$

For coordinates of A,

solve (1) &amp; (2)

simultaneously.

$$3x - 10 = -\frac{1}{2}x + \frac{1}{2}$$

(x2)

$$6x - 20 = -x + 1$$

$$7x = 21$$

$$x = 3$$

$$y = 3x - 10$$

$$y = 3(3) - 10 = -1$$

$$\therefore \underline{\underline{A \rightarrow (3, -1)}}$$

Answers to Exercise E  
are on the next  
page.

## Exercise E

1.

(a)  $m = -2, \left(-\frac{1}{2}, \frac{3}{2}\right)$

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

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

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

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

(b)  $x - 2y - 1 = 0$

$$2y = x - 1$$

$$\neq y = \frac{1}{2}x - \frac{1}{2}$$

$$m = \frac{1}{2}, (0, 0)$$

↓  
y-intercept = 0

$$\underline{\underline{y = \frac{1}{2}x}}$$

(c)  $y = x - 4$

↓

$$m = 1$$

Grad. of perpendicular  
line = -1

$$m = -1, (-1, -2)$$

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

$$y - -2 = -1(x - -1)$$

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

$$\underline{\underline{y = -x - 3}}$$

(d)  $2x + y - 9 = 0$

$$y = -2x + 9$$

$$m_{\text{perpendicular}} = \frac{1}{2}$$

$$(4, -6)$$

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

$$y - -6 = \frac{1}{2}(x - 4)$$

$$2y + 12 = x - 4$$

$$\underline{\underline{x - 2y - 16 = 0}}$$

2.

(a)  $m = 3, (-2, 5)$

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

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

$$y - 5 = 3x + 6$$

$$\underline{\underline{y = 3x + 11}}$$

(b)  $y = 3x + 6$

Perpendicular line's

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

$$m = -\frac{1}{3}, (-2, 5)$$

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

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

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

$$\underline{\underline{x + 3y - 13 = 0}}$$

$$(c) \quad 4x - 6y + 7 = 0$$

$$6y = 4x + 7$$

$$y = \frac{2}{3}x + \frac{7}{6}$$

$$m = \frac{2}{3}, \quad (3, 4)$$

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

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

$$3y - 12 = 2x - 6$$

$$\underline{\underline{2x - 3y + 6 = 0}}$$

Since the gradients are equal, the lines  $r$  and  $s$  are parallel.

$$(d) \quad 4x - 6y + 7 = 0$$

$$6y = 4x + 7$$

$$y = \frac{2}{3}x + \frac{7}{6}$$

For the perpendicular line,

$$m = -\frac{3}{2}$$

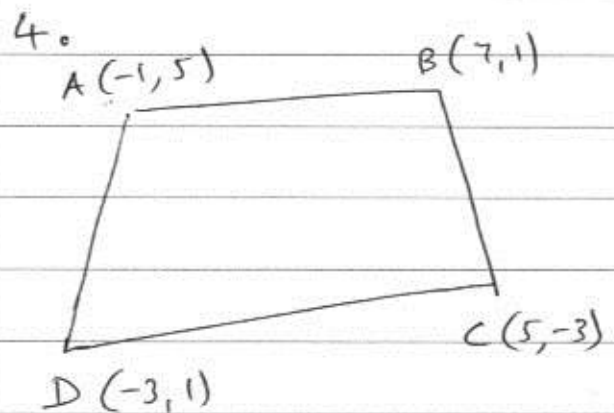
$$(3, 4)$$

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

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

$$2y - 8 = -3x + 9$$

$$\underline{\underline{3x + 2y - 17 = 0}}$$



$$m_{AB} = \frac{5-1}{-1-7} = \frac{4}{-8} = -\frac{1}{2}$$

$$m_{DC} = \frac{1-(-3)}{-3-5} = -\frac{1}{2}$$

$$\therefore m_{AB} = m_{DC}$$

Hence  $AB$  is parallel to  $DC$ .

$$m_{AD} = \frac{5-1}{-1-(-3)} = \frac{4}{2} = 2$$

$$m_{BC} = \frac{1-(-3)}{7-5} = 2$$

$$\therefore m_{AD} = m_{BC}$$

Hence  $AD$  &  $BC$  are parallel.

$$m_{AB} \times m_{AD} = -\frac{1}{2} \times 2 = -1$$

$\therefore AB$  and  $AD$  are perpendicular.

$\therefore ABCD$  must be a rectangle.

3. ~~Line S:~~

Line  $r$ :  $(1, 4)$ ,  $(6, 8)$

$$m_r = \frac{8-4}{6-1} = \frac{4}{5}$$

Line  $s$ :  $(5, -3)$ ,  $(20, 9)$

$$m_s = \frac{9-(-3)}{20-5} = \frac{12}{15} = \frac{4}{5}$$