

ANALYTIC GEOMETRY IN GRAPHS EXAMPLES

- 1) Line 1 is parallel to Line 2. Find the equation of Line 2.

1) a?

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{14 - 10}{4 - 2}$$

$$= \frac{4}{2}$$

$$= 2$$

2) b?

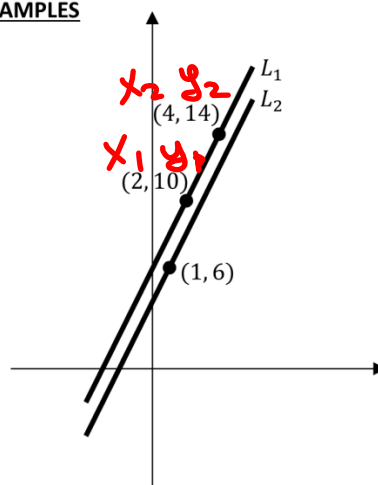
$$y = 2x + b$$

$$6 = 2(1) + b$$

$$6 = 2 + b$$

$$b = 4$$

$$y = 2x + 4$$



- 2) Find the x-intercept of Line 1.

1) a?

$$a = \frac{3 - 6}{3 - 2} = \frac{-3}{1} = -3$$

2) b?

$$y = -3x + b$$

$$3 = -3(3) + b$$

$$3 = -9 + b$$

$$3 + 9 = b$$

$$b = 12$$

$$y = -3x + 12$$

3) x-int:

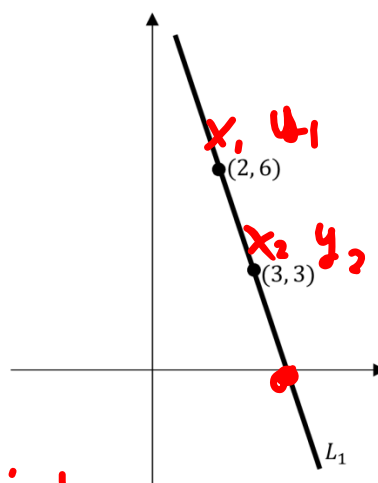
$$0 = -3x + 12$$

$$\underline{-12} = \underline{-3x}$$

$$\underline{-3} \quad \underline{-3}$$

$$x = 4$$

$$(4, 0)$$



3) Line 1 is perpendicular to Line 2. Find the distance between A and B.

1) a?

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{9 - 7}{10 - 6}$$

$$= \frac{2}{4}$$

$$= \frac{1}{2} \rightarrow -2$$

2) b?

$$y = -2x + b$$

$$7 = -2(6) + b$$

$$7 = -12 + b$$

$$19 = b$$

$$y = -2x + 19$$

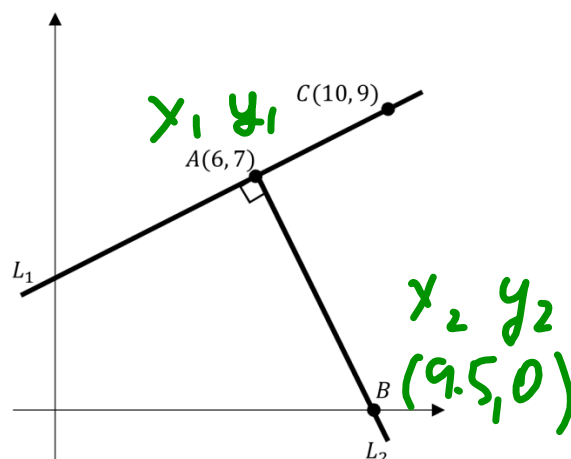
3) B?

$$0 = -2x + 19$$

$$2x = 19$$

$$x = \frac{19}{2} = 9.5$$

$$B(9.5, 0)$$



4) d?

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

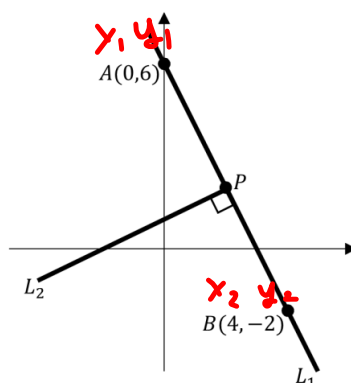
$$= \sqrt{(9.5 - 6)^2 + (0 - 7)^2}$$

$$= \sqrt{3.5^2 + (-7)^2}$$

$$= \sqrt{12.25 + 49}$$

$$= 7.83 \text{ units}$$

- 4) Find the x-intercept of Line 2.
- Line 1 is perpendicular to Line 2
 - P is the midpoint of AB



1) a ?

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-2 - 6}{4 - 0}$$

$$= -2 \rightarrow \frac{1}{2}$$

2) P ?

$$P\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$P(2, 2)$$

3) b ?

$$y = \frac{1}{2}x + b$$

$$2 = \frac{1}{2}(2) + b$$

$$2 = 1 + b$$

$$b = 1$$

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

4) x -int:

$$0 = \frac{1}{2}x + 1$$

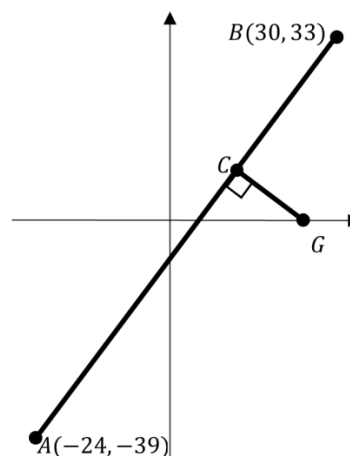
$$\frac{-1}{1} = \frac{1x}{2}$$

$$1x = -2$$

$$x = -2$$

$$(-2, 0)$$

- 5) A car is travelling along a straight path from $A(-24, -39)$ to $B(30, 33)$. The car breaks down at point C after completing $\frac{2}{3}$ of the trip. A tow truck brings the car to the garage, at point G . How far does the tow truck travel?

**SOLUTION**1: C?

$$\begin{aligned}x_p &= x_1 + \frac{a}{b}(x_2 - x_1) = -24 + \frac{2}{3}(30 - (-24)) \\&= -24 + \frac{2}{3}(54) = -24 + 36 = 12\end{aligned}$$

$$\begin{aligned}y_p &= y_1 + \frac{a}{b}(y_2 - y_1) = -39 + \frac{2}{3}(33 - (-39)) \\&= -39 + \frac{2}{3}(72) = -39 + 48 = 9\end{aligned}$$

 $C(12, 9)$ 2: a?

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{33 - (-39)}{30 - (-24)} = \frac{72}{54} = \frac{4}{3} \rightarrow -\frac{3}{4}$$

3: b?

$$y = ax + b$$

$$y = -\frac{3}{4}x + b$$

$$9 = -\frac{3}{4}(12) + b$$

$$9 = -9 + b$$

$$18 = b$$

$$\therefore y = -\frac{3}{4}x + 18$$

4: G (x - intercept)?

$$0 = -\frac{3}{4}x + 18$$

$$-18 = -\frac{3}{4}x$$

$$x = 24$$

 $G(24, 0)$ 5: d_{CG} ?

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(24 - 12)^2 + (0 - 9)^2}$$

$$= \sqrt{12^2 + (-9)^2}$$

$$= \sqrt{144 + 81}$$

$$= \sqrt{225}$$

$$\boxed{d = 15 \text{ units}}$$