

7.3 Slope-Point Form

Math 10

Slope-Point Form

The slope-point form of a linear equation is

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

- used when the slope m and a point (x_1, y_1) on the line are known
- easier to work with when the y-intercept is not easily determined
- can only be used for non-vertical lines

Example: Write the slope-point equation of a line with slope -3 and passing through the point $(-2, 5)$. Then convert the equation into slope-intercept form, $y = mx + b$.

$$m = -3, x_1 = -2, y_1 = 5$$

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

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

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

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

$$y = -3x - 1$$

Repeat the above for a line with slope 2 and passing through the point $(3, -4)$.

$$m = 2, x_1 = 3, y_1 = -4$$

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

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

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

$$y + 4 = 2x - 6$$

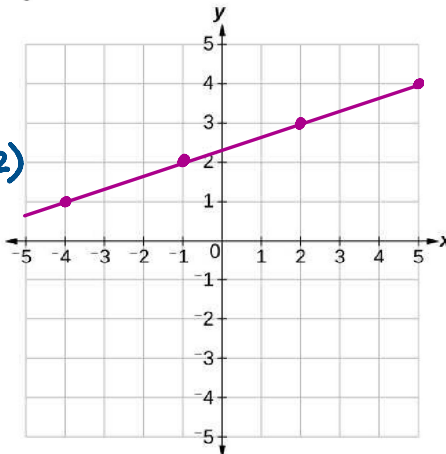
$$y = 2x - 10$$

Example: Draw the graph of $y - 2 = \frac{1}{3}(x + 1)$.

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

$$x_1 = -1, y_1 = 2$$

→ starting point: $(-1, 2)$



Example: Use slope-point form to write an equation of the line through $(3, -4)$ and $(5, -1)$. Then convert to general form, $Ax + By + C = 0$.

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-4)}{5 - 3} = \frac{3}{2}$$

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

$$2(y + 4) = \left[\frac{3}{2}(x - 3)\right] \cdot 2$$

$$2y + 8 = 3(x - 3)$$

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

↙ ↘

$$0 = 3x - 2y - 9 - 8$$

$$3x - 2y - 17 = 0$$

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

$$2(y + 1) = \left[\frac{3}{2}(x - 5)\right] \cdot 2$$

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

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

↙ ↘

$$-3x + 2y + 2 + 15 = 0$$

$$(-3x + 2y + 17 = 0) \cdot (-1)$$

$$3x - 2y - 17 = 0$$

Application

A dog runs at a constant speed from one side of the dog park to her owner, 120 metres away. After about 5 seconds the dog is 80 metres from her owner. Write an equation that describes the dog's distance, d , in metres, from her owner in terms of s seconds after she started running.

*distance depends on time

$(0, 120)$, $(5, 80)$

$$\text{slope} = \frac{120 - 80}{0 - 5} = \frac{40}{-5} = -8 \leftarrow \text{The dog is running toward her owner at a speed of } 8 \text{ m/s.}$$

$$d - 120 = -8(s - 0) \quad \leftarrow \text{OR} \rightarrow \quad d - 80 = -8(s - 5)$$

$$d - 120 = -8s$$

How long will it take the dog to reach her owner?

$$d - 120 = -8s$$

↑
0

$$-120 = -8s$$

$$\div -8 \quad \div -8$$

$$15 = s$$

It takes the dog 15 seconds to reach her owner.

Assignment: p.152 #(1-3)ad, 4-6, 9, 11bcde