

EXAMPLE

Graph: $3x - 4y = 12$

$$(x_1, y_1) \quad (x_2, y_2)$$

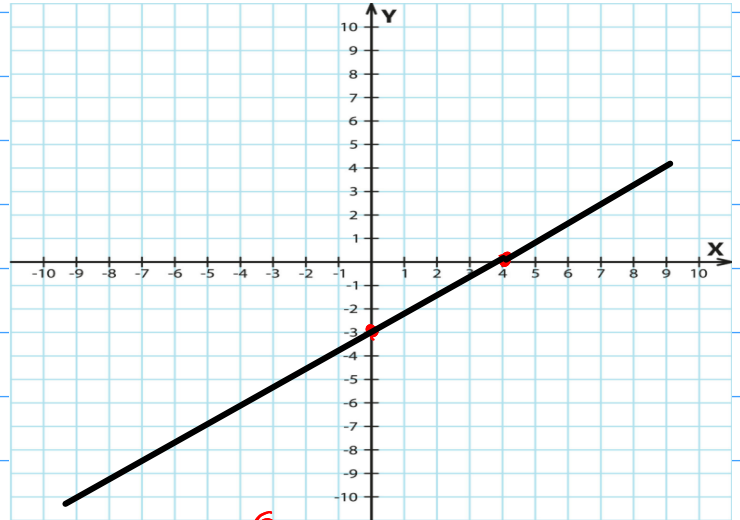
$$(0, -3) \quad (4, 0)$$

$$3x - 4y = 12$$

$$0 - 4y = 12$$

$$\frac{-4y}{-4} = \frac{12}{-4}$$

$$y = -3$$



$$3x - 4y = 12$$

$$\frac{3x}{3} = \frac{12}{3} \Rightarrow x = 4$$

EXAMPLE

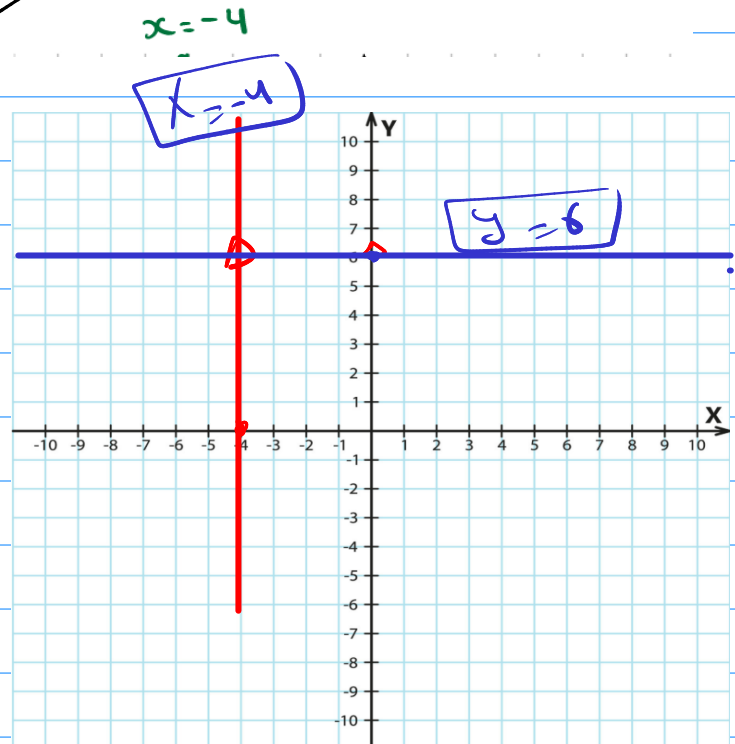
Horizontal and Vertical Lines

(A) Graph $x = -4$ and $y = 6$ simultaneously in the same rectangular coordinate system.

(B) Write the equations of the vertical and horizontal lines that pass through the point $(7, -5)$.

(A) $x = -4$ and $y = 6$

(B) $x = 7$ and $y = -5$



EXAMPLE 4

Finding Slopes Sketch a line through each pair of points, and find the slope of each line.

(A) $(-3, -2), (3, 4)$

(B) $(-1, 3), (2, -3)$

(C) $(-2, -3), (3, -3)$

(D) $(-2, 4), (-2, -2)$

(A) $m = \frac{y_2 - y_1}{x_2 - x_1}$

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

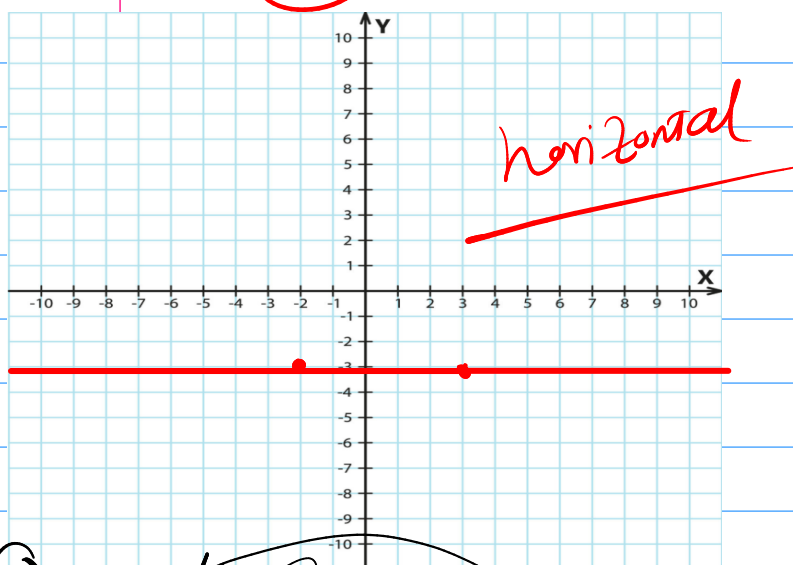
$m = 1$ + Positive

B = $(-1, 3), (2, -3)$

$m = \frac{-3 - 3}{2 - (-1)} = \frac{-6}{3} = -2$

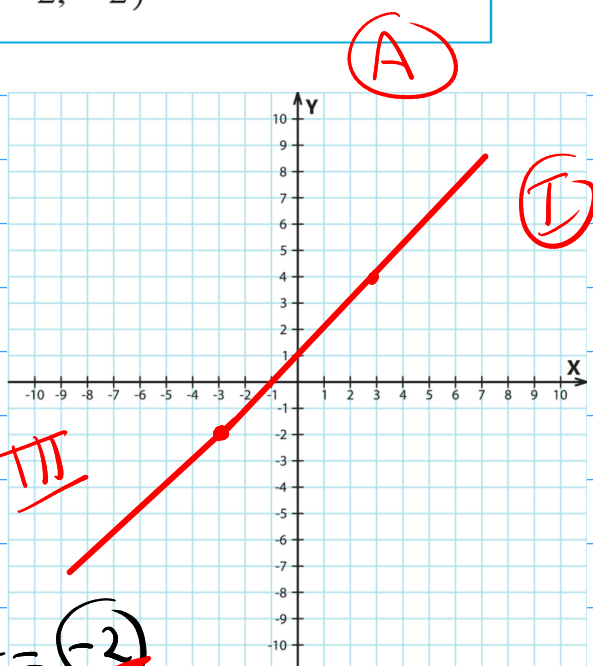
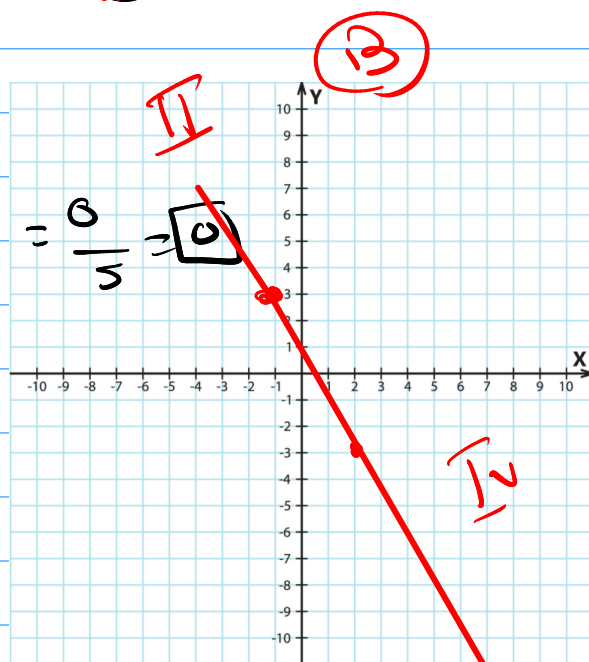
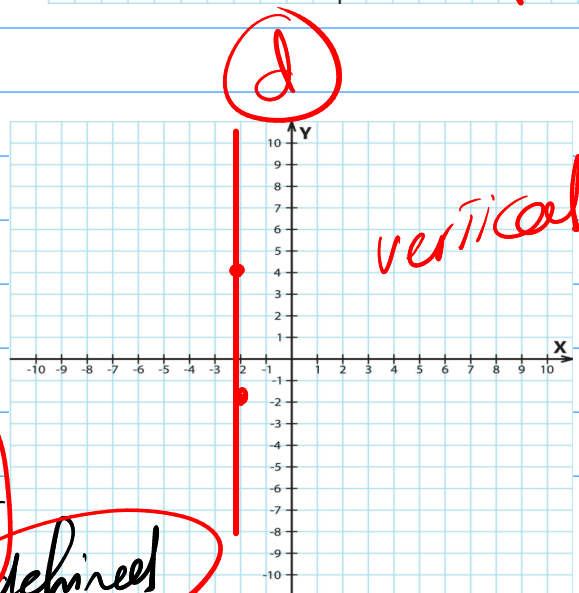
(C) $(-2, -3), (3, -3)$

$m = \frac{-3 - (-3)}{3 - (-2)} = \frac{-3+3}{3+2} = \frac{0}{5} = 0$



(d) $(-2, 4), (-2, -2)$

$m = \frac{-2 - 4}{-2 - (-2)} = \frac{-6}{0}$ undefined



EXAMPLE 5 Using the Slope-Intercept Form(A) Find the slope and y intercept, and graph $y = -\frac{2}{3}x - 3$.

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

y-intercept $b = -3$

$$-\frac{2}{3} - \frac{3}{1} = \frac{-2-9}{3} = \frac{-11}{3}$$

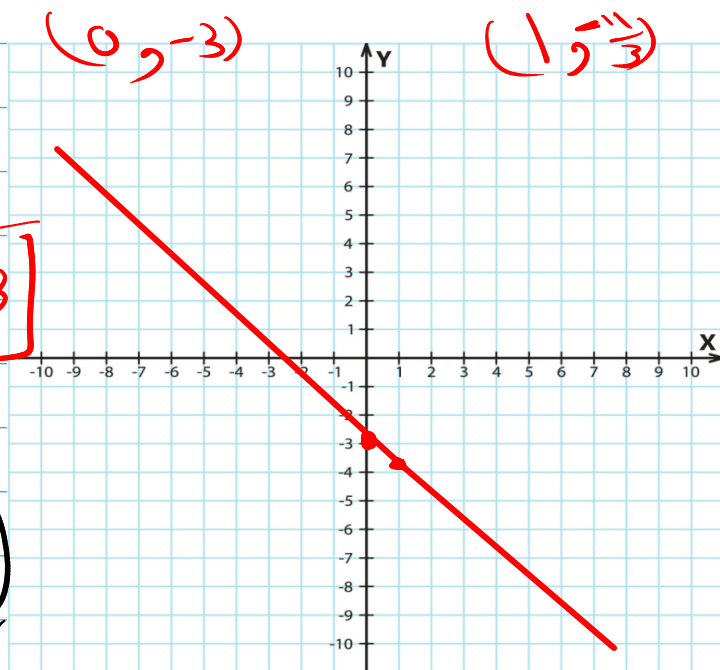
(B) Write the equation of the line with slope $\frac{2}{3}$ and y intercept -2 .

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

$$y = mx + b$$

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

(B) $y = mx + b$
 $y = \frac{2}{3}x - 2$

**EXAMPLE 6** Using the Point-Slope Form(A) Find an equation for the line that has slope $\frac{1}{2}$ and passes through $(-4, 3)$. Write the final answer in the form $Ax + By = C$.

$$m = \frac{1}{2}$$

point $(-4, 3)$

$$y = mx + b$$

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

$$-4 = \frac{1}{2}(3) + b$$

$$-4 = \frac{3}{2} + b$$

$$b = -4 - \frac{3}{2} = \frac{-8-3}{2} = \frac{-11}{2}$$

$$2y = \frac{1}{2}x - \frac{11}{2} \quad \times 2$$

$$b = -5.5$$

$$2y = x - 11 \Rightarrow \boxed{2y - x = -11}$$

$$A = -1 \quad B = 2 \quad C = -11$$

(B) Find an equation for the line that passes through the points $(-3, 2)$ and $(-4, 5)$. Write the resulting equation in the form $y = mx + b$.

* homework

$$* y = mx + b$$

$$m = ?$$

$$b = ?$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 2}{-4 - (-3)} = \frac{3}{-4 + 3}$$

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

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

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

$$(y - 2) = -1(x + 3)$$

$$y - 2 = -x - 3 \Rightarrow \boxed{y + x = -1}$$

From Past Exams:

Find the values of a and b such that the line with equation $ax - 2y = b$ passes through the point $(1, 4)$ and has slope $m = 3$.

$$ax - 2y = b$$

$$y = mx + b$$

$$y = 3x + b$$

$$4 = 3(1) + b$$

$$4 = 3 + b$$

$$4 - 3 = b$$

$$\boxed{b = 1}$$

$$y = 3x + 1$$

$$(1, 4) \quad m = 3$$

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

$$(y - 4) = 3(x - 1)$$

$$y - 4 = 3x - 3$$

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

$$y - 3x = +1$$

$$ax - 2y = b$$

$$ax - b = 2y$$

$$a - b$$

$$-b = +2$$

$$b = -2$$

$$y = 3x + 1$$

$$2y = 6x + 2$$

Find the slope, and the x- and y-intercepts of the line whose equation is $10y = 2x - 7$.

$$\begin{aligned} \text{y-intercept} &= b \\ \text{x-intercept} &= -\frac{b}{m} \end{aligned}$$

$$\frac{10y}{10} = \frac{2x}{10} - \frac{7}{10}$$

$$y = mx + b$$

$$m = \frac{2}{10} = \frac{1}{5}$$

$$b = -\frac{7}{10}$$

$$\text{y-intercept } y = b$$

$$y = -\frac{7}{10}$$

$$\text{x-intercept} = -\frac{b}{m} = \frac{7/10}{1/5} = \boxed{7/2}$$

Find the slope-intercept form of the equation of the line through the points $(-3, 4)$ and $(2, 1)$.

Write the equation in the standard form $Ax + By = C$, where A , B , and C are integers.

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

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

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

$$y - 1 = \frac{-3}{5}x + \frac{6}{5}$$

$$y = \frac{-3}{5}x + \frac{6}{5} + 1$$

$$y = -\frac{3}{5}x + \frac{6+5}{5}$$

$$y = -\frac{3}{5}x + \frac{11}{5}$$

$$\times 10$$

$$10y = -15x + 22$$

$$\log y + 15x = 22$$

$$\left. \begin{array}{l} A = 15 \\ B = 10 \\ C = 22 \end{array} \right\}$$

Find an equation of the line whose x-intercept is 2 and y-intercept is -3.

$$x_{\text{intercept}} = 2 = \frac{-b}{m}$$

$$y_{\text{intercept}} = -3 = c$$

$$y = mx + b$$

$$y = mx - 3$$

$$\frac{-b}{m} = 2 = \frac{-(-3)}{m}$$

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

$$\Rightarrow 3 = 2m$$

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

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