

# Writing Equations of Lines

# I. How to Write an Equation of a Line Given $m$ and $b$

1. Write down  $y = mx + b$
2. Substitute *slope* for  $m$  and *y-intercept* for  $b$ .
3. Simplify the equation

**Write the equation of the line  
given m and b.**



**Ex. 1 Slope is -5 and y-intercept is 2**

$$y = -5x + 2$$



**Ex. 2 Slope is  $-1/2$  and y-intercept is -2**

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

Write the equation of the line  
given  $m$  and  $b$

Ex. 3 Slope is 0 and  $y$ -intercept is 3

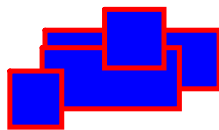
$$y = 3$$

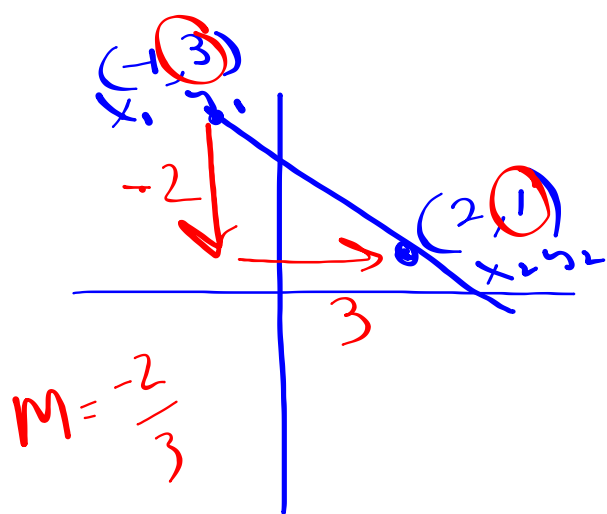
Ex. 4 Slope is  $\frac{1}{3}$  and  $y$ -intercept is 0

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

## II. How to Write an Equation of a Line Given a Graph

1. Write down  $y = mx + b$
2. Use any 2 "good" points on the graph to find the slope,  $m$ .  $m = \frac{y_2 - y_1}{x_2 - x_1}$   
*Change in y*  
*Change in x*
3. Find the  $y$ -intercept on the graph,  $b$ .
4. Substitute *slope* for  $m$  and *y-int* for  $b$  into the equation  $y = mx + b$ .



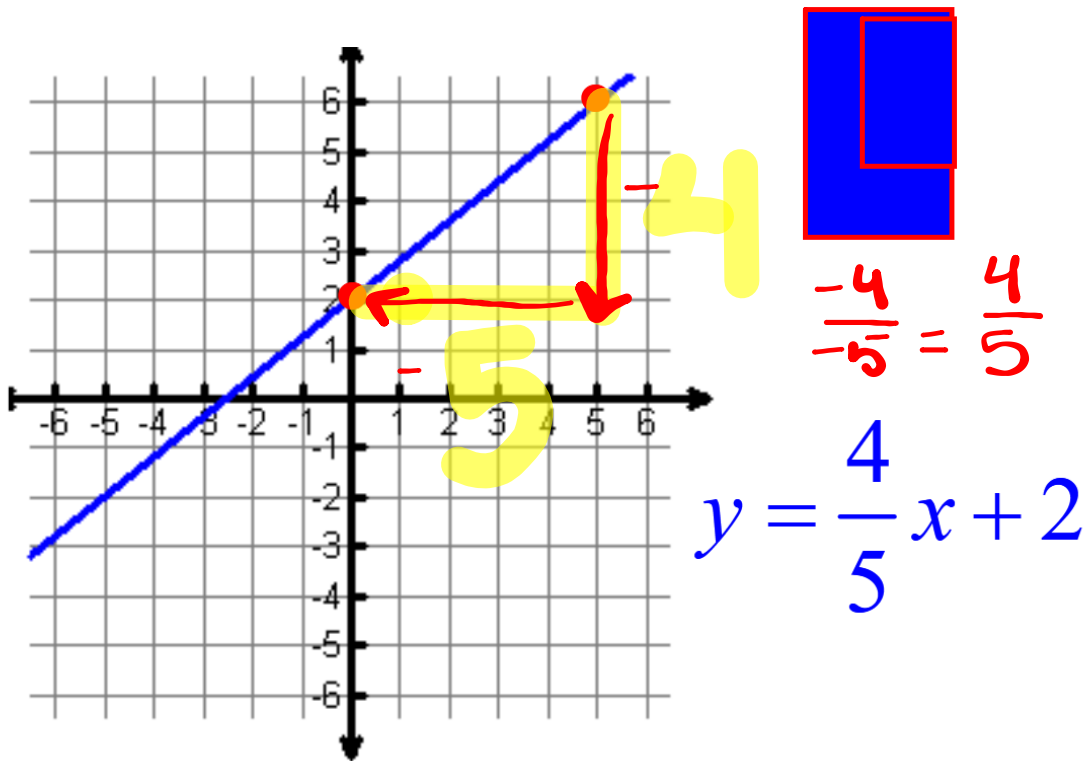


$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

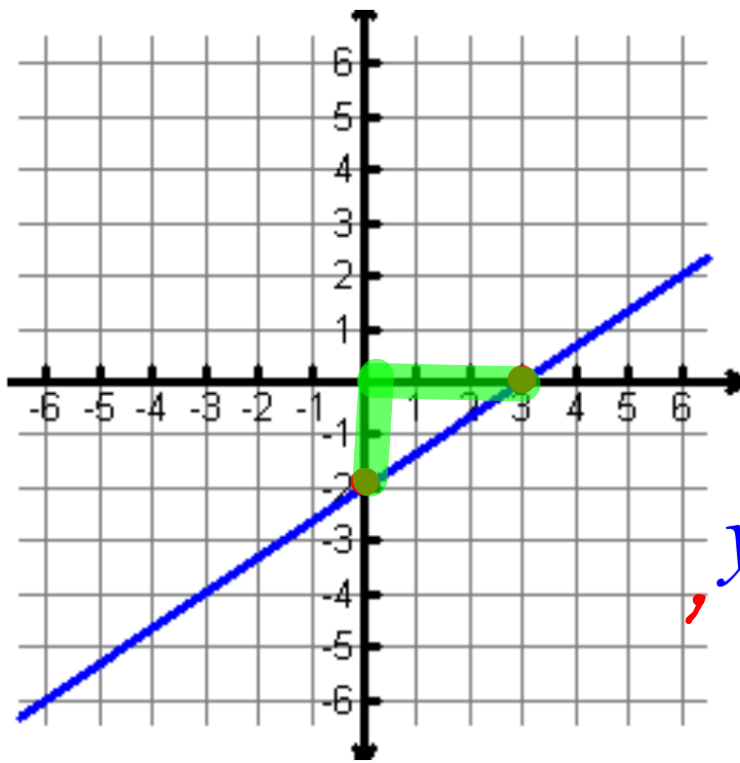
$$= \frac{1 - 3}{2 - (-1)} = \frac{-2}{3}$$

$\frac{-2}{3}$

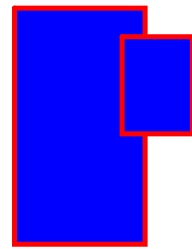
## 5. Write the equation of this graph



## 6. Write the equation of this graph

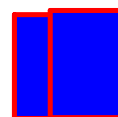
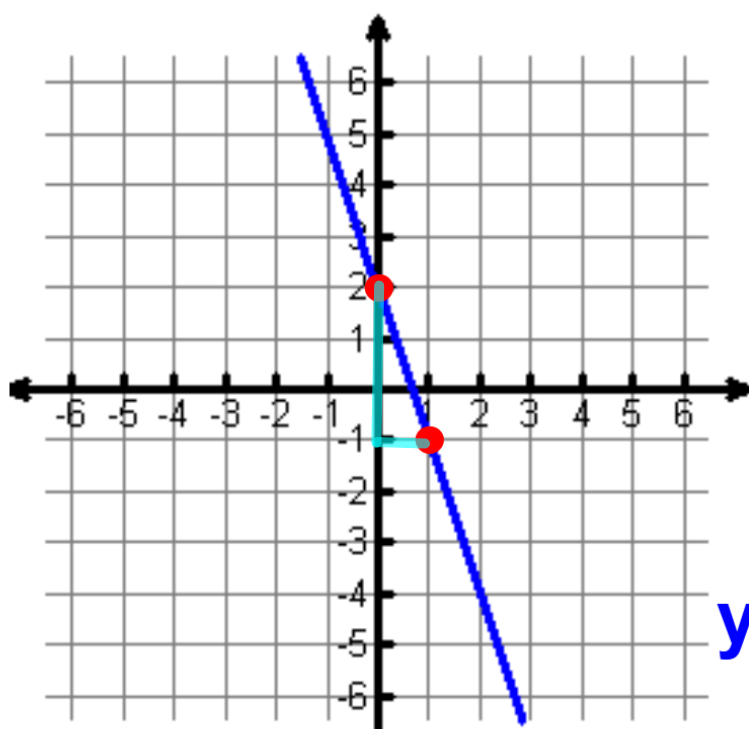


$$y = \frac{2}{3}x - 2$$



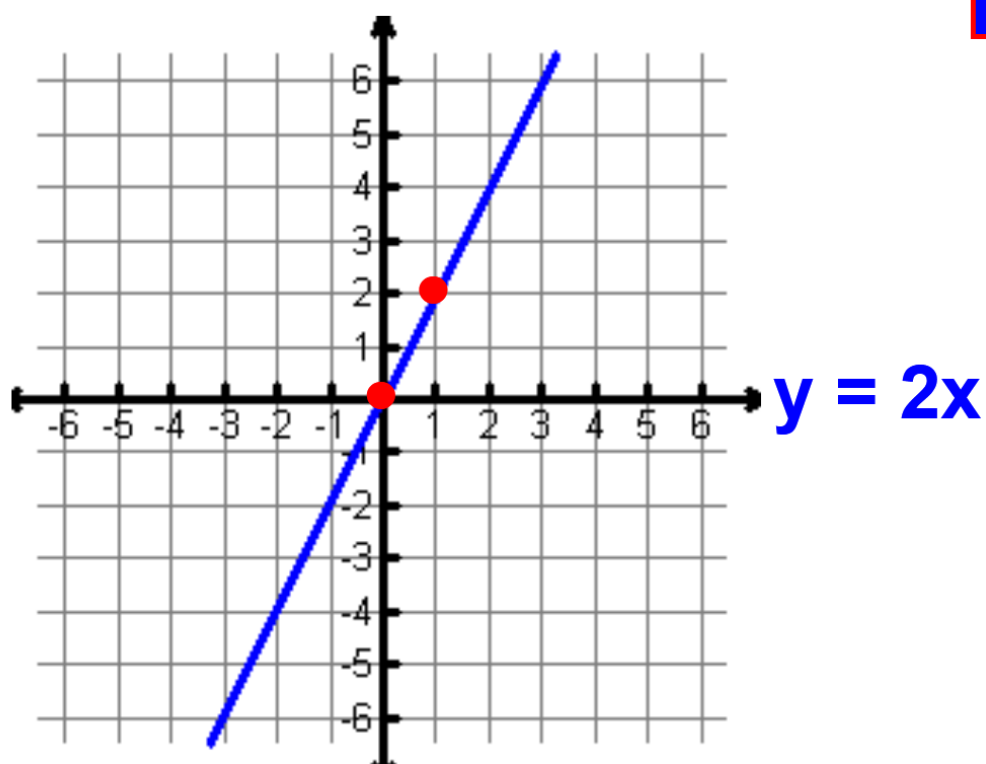


## 7. Write the equation of this graph

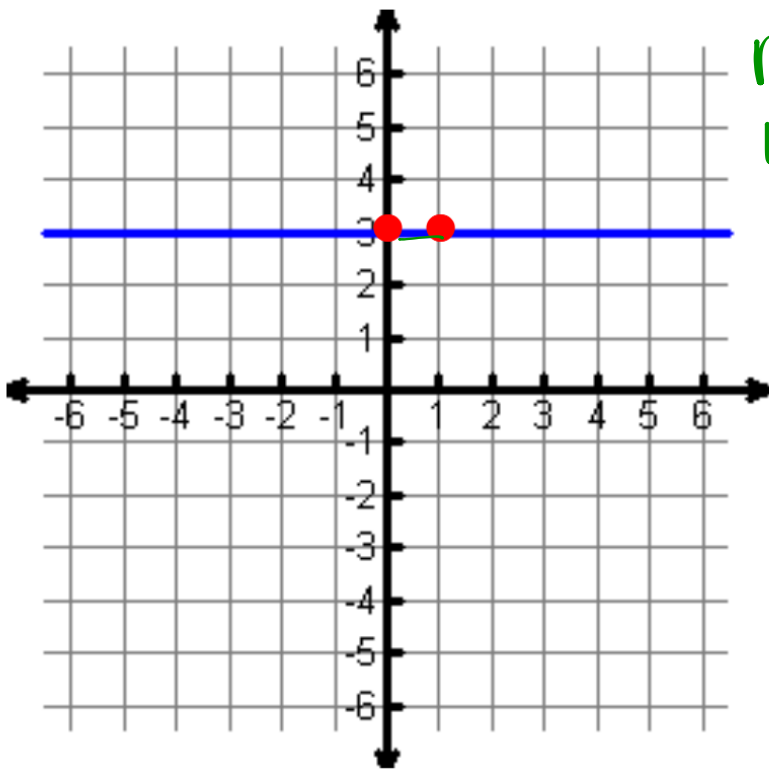


$$y = -3x + 2$$

8. Write the equation of this graph



## 9. Write the equation of this graph

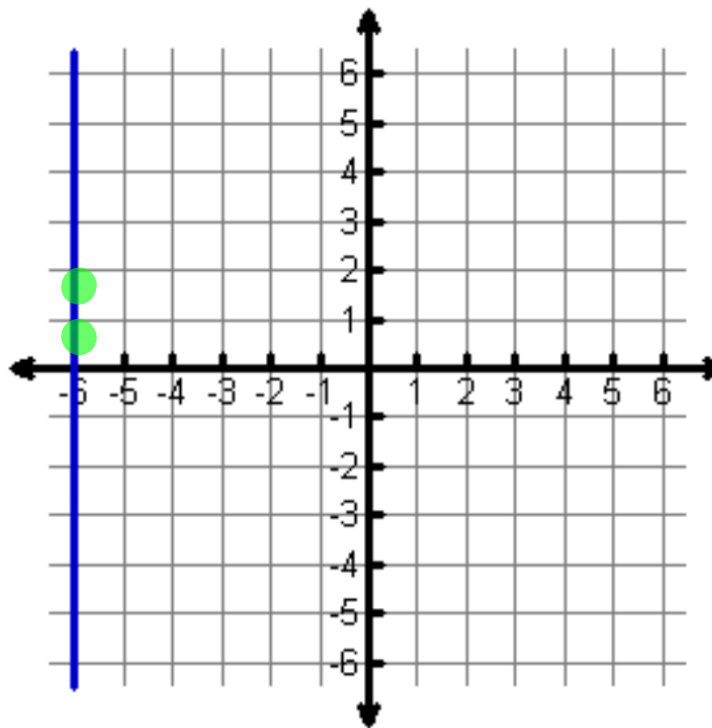


$$m = \frac{0}{1} = 0$$
$$b = 3$$
$$y = 0x + 3$$
$$y = 3$$

$$y = 3$$



10. Write the equation of this graph

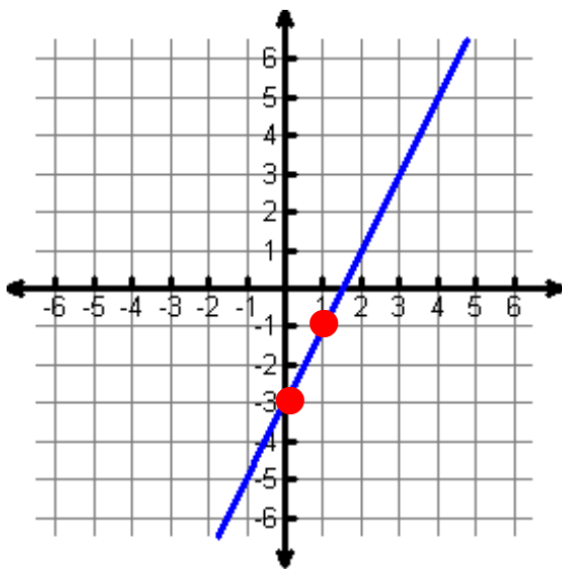


$\frac{1}{0} = \text{undefined}$

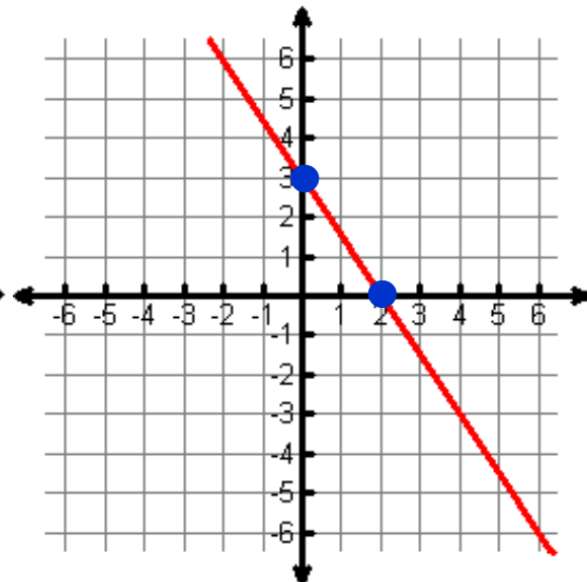
$x = -6$



11. & 12. Write the equation of each graph



$$y = \boxed{\phantom{000}}$$



$$y = \boxed{\phantom{000}}$$

### III. How to Write an Equation of a Line Given $m$ and a point

1. Write down  $y = mx + b$ .

2. Substitute slope for  $m$  and the point  $(x, y)$ .

3. Solve for  $b$ .

4. Substitute  $m$  and  $b$  back into the equation.

Write the equation of the line given  $m$  and a point

Ex 13:  $m = 2$  Point:  $(\overset{x}{2}, \overset{y}{3})$

$$y = mx + b$$

$$3 = 2(2) + b$$

$$b = -1$$

$$y = \boxed{\phantom{000}}$$

$$\boxed{y = 2x - 1}$$

Write the equation of the line given  $m$  and a point

Ex 14:  $m = 1/2$  Point:  $(4, -3)$

$$y = mx + b$$

$$-3 = 1/2 (4) + b$$

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

$$b = -5$$

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

$$y = 1/2 x - 5$$



Write the equation of the line given  $m$  and a point

**Ex 15:**  $m = -2$  Point: (<sup>x</sup> $\boxed{-5}$ , <sup>y</sup> $\boxed{3}$ )

$$\boxed{y} = mx + b$$

$$\boxed{3} = -2(\boxed{-5}) + b$$

$$b = -7$$

$$y = -2x - 7$$

Write the equation of the line given  $m$  and a point

**Ex: 16**

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



Write the equation of the line given  $m$  and a point

**Ex: 17**

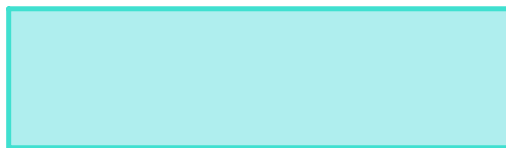
$$m = \frac{1}{2} \quad (-1, -2)$$

$$y =$$

Write the equation of the line given  $m$  and a point

**Ex: 18**

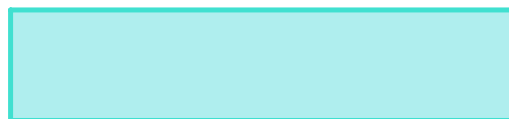
**$m = 2$     $(0,3)$**



Write the equation of the line given  $m$  and a point

**Ex: 19**

**$m = 3$     $(3,0)$**



Write the equation of the line given  $m$  and a point

**Ex: 20**

$$x = 3$$

**$m = \text{undefined}$  (3,6)**

no  $y =$



#### IV. How to Write an Equation of a Line **Given TWO points**

1. Write down  $y = mx + b$ .
2. Use the slope formula to find  $m$ .
3. Pick one of the ordered pairs & substitute slope for  $m$  and the point  $(x, y)$ .
4. Solve for  $b$ .
5. *Substitute  $m$  and  $b$  into the equation.*

## Equation of a Line - Given 2 points

Ex: 21  $(2, 3)$   $(4, 5)$   $\frac{+2}{+2} = 1$

$$m = \frac{5 - 3}{4 - 2} = \frac{2}{2} = 1$$

$$y = mx + b$$

$$3 = 1(2) + b$$

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

$$b = 1$$

$$y = x + 1$$



## Equation of a Line - Given 2 points

Ex: 22  $(2, 3)$   $(-4, 15)$   $\frac{12}{-6} = -2$

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

$(2, 3)$   
x y

$m = -2$

$$y = mx + b$$

$$3 = -2(2) + b$$

$$3 = -4 + b$$

$$\begin{array}{r} +4 \\ +4 \end{array} \quad \begin{array}{r} +4 \\ +4 \end{array} \quad +b$$

$b = 7$

$$y = -2x + 7$$

## Equation of a Line - Given 2 points

Ex: 23 (2, 2) (0, 4)

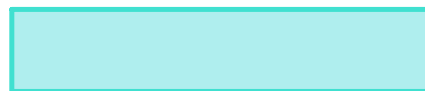
$$m = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} = \boxed{\phantom{000}} = \boxed{\phantom{000}}$$

$$y = -x + 4$$

## Equation of a Line - Given 2 points

**Ex: 24**

**(2,3) (1,4)**



## Equation of a Line - Given 2 points

**Ex: 25**

**(4,5)    (5,2)**

