

★ Show  
check  
on calc

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## How Do We Write An Equation For A Line?

To write an equation for a line, determine its slope and y-intercept. Then, use the slope-intercept formula:  $y = mx + b$ .

$y = mx + b$   
↑ slope    ↑ y-int

① To write an equation for a line with a given slope and passing through a given point we: *check on calc; put equation into y= + go to 2nd graph (table) etc*

Method:

- 1) Use the slope-intercept form of an equation,  $y = mx + b$ , and substitute the given value of the slope for "m"
- 2) Use the x and y values of the given point for the x and y in the equation.
- 3) Solve for "b" (the y-intercept.)
- 4) In the equation  $y = mx + b$ , replace "m" with the given slope and "b" with the value you found in step 3.

Example:

Write the equation of the line through (2, 16) that has a slope of -5 → m

$y = mx + b$   
 $m = -5$   
 $b = 26$

$y = -5x + 26$

$y = mx + b$      $m = -5$     (2, 16)  
 $16 = -5(2) + b$     x    y

$16 = -10 + b$   
 $+10$      $+10$

$26 = b$

work to figure out b

Examples:

1) Write the equation of the line through (3, 5) that has a slope of 4

$y = mx + b$   
 $m = 4$   
 $b = -7$

$y = 4x - 7$

$y = mx + b$      $m = 4$     (3, 5)  
 $5 = 4(3) + b$     x    y  
 $5 = 12 + b$   
 $-12$      $-12$   
 $-7 = b$

2) Write an equation of the line whose slope is 2, and that passes through the point (-3, 4).

$y = mx + b$   
 $m = 2$   
 $b = 10$

$y = 2x + 10$

$y = mx + b$      $m = 2$     (-3, 4)  
 $4 = 2(-3) + b$     x    y  
 $4 = -6 + b$   
 $+6$      $+6$   
 $10 = b$

② To write an equation for a line passing through two given points we:

Method:

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

1) Use the **slope formula** to find the slope of the line passing through the given points

2) In  $y = mx + b$ , replace  $m$  by the slope

3) Select one of the given points that is on the line and replace the  $x$  and  $y$  with those coordinate values.

4) Solve the resulting equation to find the value of  $b$ , the  $y$ -intercept.

5) Now replace  $b$  with its correct value and check to make sure that the coordinates of the second point satisfy the equation.

Example:

Write an equation of the line that passes through the points  $(3, 7)$  and  $(5, 15)$ .

$$y = mx + b$$

$$m = 4$$

$$b = -5$$

$$y = 4x - 5$$

$$(3, 7) \quad (5, 15)$$

$$x_1 \quad y_1 \quad x_2 \quad y_2$$

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

$$m = \frac{15 - 7}{5 - 3}$$

$$m = \frac{8}{2}$$

$$m = 4$$

Work to figure out  $m$

$$y = mx + b \quad m = 4 \quad (3, 7)$$

$$7 = 4(3) + b$$

$$7 = 12 + b$$

$$-12 \quad -12$$

$$-5 = b$$

can pick either of the points to solve for  $b$

Examples:

1) Write an equation of the line that passes through the points  $(2, 5)$  and  $(4, 11)$ .

$$y = mx + b$$

$$m = 3$$

$$b = -1$$

$$y = 3x - 1$$

$$(2, 5) \quad (4, 11)$$

$$x_1 \quad y_1 \quad x_2 \quad y_2$$

$$y = mx + b \quad m = 3 \quad (2, 5)$$

$$5 = 3(2) + b$$

$$5 = 6 + b$$

$$-6 \quad -6$$

$$-1 = b$$

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

$$m = \frac{11 - 5}{4 - 2}$$

$$m = \frac{6}{2} \quad m = 3$$

2) Write an equation of the line that passes through the points  $(0, -1)$  and  $(6, 8)$ .

$$y = mx + b$$

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

$$b = -1$$

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

$$(0, -1) \quad (6, 8)$$

$$x_1 \quad y_1 \quad x_2 \quad y_2$$

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

$$m = \frac{8 - (-1)}{6 - 0}$$

$$m = \frac{9}{6}$$

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

$$y = mx + b \quad m = \frac{3}{2} \quad (0, -1)$$

$$-1 = \frac{3}{2}(0) + b$$

$$-1 = 0 + b$$

$$-1 = b$$

$$-1 = b$$

# Equations Continued

## How Do We Write An Equation From A Table Of Values?

★ you can pick any two coordinates from the table to use for  $m$  &  $b$   
 1) Provided the table of values, which equation correctly represents the relationship between  $x$  and  $y$ .

$$y = mx + b$$

$$m = 2$$

$$b = -3$$

x	y
2	1
3	3
5	7
7	11

$$y = 2x - 3$$

a)  $y = 2x - 3$

b)  $y = x + 2$

c)  $y = 2x + 3$

d)  $y = 2x + 2$

$(2, 1)$   $(3, 3)$   
 $x_1, y_1$   $x_2, y_2$

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

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

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

$$y = mx + b$$

$$m = 2$$

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

$$3 = 6 + b$$

$$-6 = -6$$

$$-3 = b$$

you can pick any point from table to figure out  $b$

2) Provided the table of values, write an equation which correctly represents the relationship between  $x$  and  $y$ .

$$y = mx + b$$

$$m = 1$$

$$b = 4$$

x	y
1	5
2	6
3	7
4	8

$$y = x + 4$$

$(1, 5)$   $(2, 6)$   
 $x_1, y_1$   $x_2, y_2$

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

$$m = \frac{6 - 5}{2 - 1}$$

$$m = 1$$

$$y = mx + b$$

$$m = 1$$

$$(1, 5)$$

$$x, y$$

$$5 = 1(1) + b$$

$$5 = 1 + b$$

$$-1 = -1$$

$$4 = b$$

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