

### 3.7 - Writing Linear Equations in the Three Forms

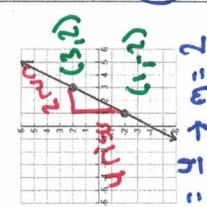
Let's review the THREE FORMS of linear equations →

"Name" of Form	"Formula" of Form	Meaning of Variables	Use When Given...
<b>Slope-Intercept Form</b>	$y = mx + b$	<b>m:</b> the slope of the line. <b>b:</b> y-intercept (0, b)	Two pts and one of the pts is the y-intercept.
<b>Standard Form</b>	$Ax + By = C$	<b>A ≥ 0</b> (has to be "+") <b>A and B</b> both cannot = 0 at same time. <b>NO Fractions/Decimals</b>	x- and y-intercepts.
<b>Point-slope Form</b>	$y - y_1 = m(x - x_1)$	<b>m:</b> the slope <b>(x<sub>1</sub>, y<sub>1</sub>):</b> a pt on the line.	Two pts and neither are intercepts.

**Slope (m) =  $\frac{\text{rise}}{\text{run}}$**   
 $m = \frac{y_2 - y_1}{x_2 - x_1}$

**\* NOTE: You MUST BE able to INTERCHANGE (convert) between ALL THREE FORMS!! \***

**Example 1:** Use the given information to transform each line into the three forms

Given Information	Point-Slope Form	Slope-Intercept Form	Standard Form
a)  $m = 2$ $(-10, 8)$ and $(0, 2)$	$m = 2$ $y - 2 = 2(x - 1)$ $(1, 2)$ $y - 2 = 2(x - 3)$ $m = 2$	<b>Solve for y!</b> $y - 2 = 2(x - 1)$ $+2$ $y = 2x - 2 + 2$ $y = 2x - 4$	$y = 2x - 4$ $-2x$ $-2x + y = -4$ $+1$ $2x - y = 4$
b) $m = \frac{2}{3}$ $(-10, 8)$ and $(0, 2)$	$m = \frac{2}{3}$ $y - 8 = \frac{2}{3}(x - (-10))$ $(-10, 8)$ $y - 2 = \frac{2}{3}(x - 0)$ $y - 2 = -\frac{2}{3}x + 10$ $y - 2 = -\frac{2}{3}x$	$y - 2 = \frac{2}{3}x + 10$ $-10$ $y - 12 = \frac{2}{3}x$ $+3x$ $3y - 12 = 2x$ $3y - 2x = 12$	$3y - 2x = 12$ $-3y$ $-2x + 3y = 12$ $+12$ $-2x + 3y = 0$ $2x - 3y = 0$

**\* Found slope and was given y-intercept! \***

**c)  $x_1, y_1$  and  $x_2, y_2$**   
 $(-8, -1)$  and  $(4, 2)$   
 $m = \frac{2 - (-1)}{4 - (-8)} = \frac{3}{12} = \frac{1}{4}$   
**x-int:** 2 and **y-int:** 6  
 $(2, 0)$  and  $(0, 6)$   
 $m = \frac{6 - 0}{0 - 2} = \frac{6}{-2} = -3$

**d)  $x_1, y_1$  and  $x_2, y_2$**   
 $(-8, -1)$  and  $(4, 2)$   
 $m = \frac{2 - (-1)}{4 - (-8)} = \frac{3}{12} = \frac{1}{4}$   
 $y - (-1) = \frac{1}{4}(x - (-8))$   
 $y + 1 = \frac{1}{4}(x + 8)$   
 $m = \frac{1}{4}$   
 $y - 2 = \frac{1}{4}(x - 4)$   
 $m = -3$   
 $y - 0 = -3(x - 2)$   
 $y = -3(x - 2)$   
 $m = -3$   
 $y - 6 = -3(x - 0)$   
 $y - 6 = -3x$

**e)  $x_1, y_1$  and  $x_2, y_2$**   
 $(-8, -1)$  and  $(4, 2)$   
 $m = \frac{2 - (-1)}{4 - (-8)} = \frac{3}{12} = \frac{1}{4}$   
 $y - (-1) = \frac{1}{4}(x - (-8))$   
 $y + 1 = \frac{1}{4}(x + 8)$   
 $m = \frac{1}{4}$   
 $y - 2 = \frac{1}{4}(x - 4)$   
 $m = -3$   
 $y - 0 = -3(x - 2)$   
 $y = -3(x - 2)$   
 $m = -3$   
 $y - 6 = -3(x - 0)$   
 $y - 6 = -3x$

**f)  $x_1, y_1$  and  $x_2, y_2$**   
 $(9, 6)$  and  $(0, 0)$   
 $m = \frac{0 - 6}{0 - 9} = \frac{-6}{-9} = \frac{2}{3}$

**g)  $x_1, y_1$  and  $x_2, y_2$**   
 $(-8, -1)$  and  $(4, 2)$   
 $m = \frac{2 - (-1)}{4 - (-8)} = \frac{3}{12} = \frac{1}{4}$   
 $y - (-1) = \frac{1}{4}(x - (-8))$   
 $y + 1 = \frac{1}{4}(x + 8)$   
 $m = \frac{1}{4}$   
 $y - 2 = \frac{1}{4}(x - 4)$   
 $m = -3$   
 $y - 0 = -3(x - 2)$   
 $y = -3(x - 2)$   
 $m = -3$   
 $y - 6 = -3(x - 0)$   
 $y - 6 = -3x$