

Name: _____

Date: _____

Notes: Linear Equations in Different Forms

Do Now: Find the equation of each linear relation in $y = mx + b$ form.

1) Find the equation of a line that passes through the point (1,4) and has a slope of -2 in $y = mx + b$ form.

$$y = -2x + 6$$

$$x, y \quad m = -2$$

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

$$4 = -2 + b$$

$$6 = b$$

2)

A typical cell phone plan has a fixed base fee that includes a certain amount of data and an overage charge for data use beyond the plan. A cell phone plan charges a base fee of \$62 and an overage charge of \$30 per gigabyte of data that exceed 2 gigabytes. If C represents the cost and g represents the total number of gigabytes of data, which equation could represent this plan when more than 2 gigabytes are used?

- ~~(1) $C = 30 + 62(2 - g)$~~ (3) $C = \underline{62} + \underline{30(2 - g)}$
- ~~(2) $C = 30 + 62(g - 2)$~~ (4) $C = \underline{62} + \underline{30(g - 2)}$

WE CAN WRITE EQUATIONS IN SO MANY DIFFERENT WAYS!!!!

$$4 - 2y = 2x$$

1) Slope-Intercept Form: $y = mx + b$

$$\begin{aligned} 4 - 2y &= 2x \\ -2y &= 2x - 4 \\ y &= -x + 2 \end{aligned}$$

2) Standard Form $Ax + By = C$ where A, B, C are integers

$$\begin{aligned} 4 - 2y &= 2x \\ 2x + 2y &= 4 \end{aligned}$$

3) Point-Slope Form

a specific point

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

x_1, y_1 m slope

Ex: A line that passes through (2,1) and $m = 2$.

$$y - y_1 = m(x - x_1)$$
$$y - 1 = 2(x - 2)$$

A line that passes through the point $(4, -2)$ and has a slope of -1 .

Slope-Intercept Form

$$y = mx + b$$

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

$$-2 = -4 + b$$

$$b = 2$$

$$y = -x + 2$$

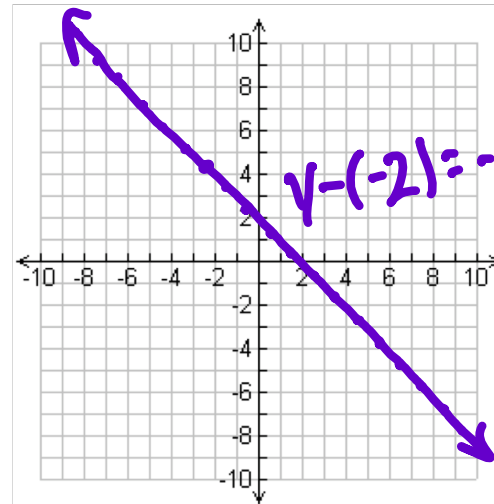
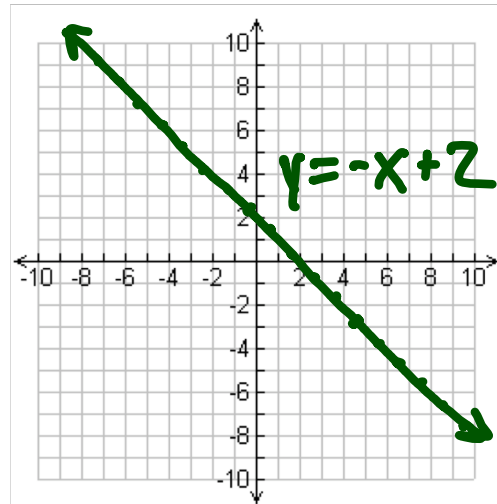
Point-Slope Form

$$y - y_1 = m(x - x_1)$$
$$y - (-2) = -1(x - 4)$$

Point: $(-2, 4)$

Slope: $-\frac{1}{1}$

Using your equation, graph the line.



Standard Form

$$Ax + By = C$$

$$y = -x + 2$$

$$x + y = 2$$

Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points $(-3, 4)$ and $(6, 1)$. Sue wrote $y - 4 = -\frac{1}{3}(x + 3)$ and Kathy wrote $y = -\frac{1}{3}x + 3$. Justify why both students are correct.

$$m = \frac{4-1}{-3-6} = \frac{3}{-9} = -\frac{1}{3}$$

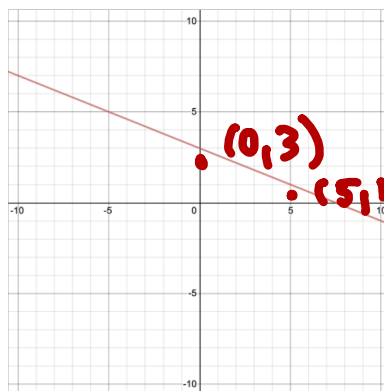
$$y - 4 = -\frac{1}{3}(x - (-3))$$

$$y - 4 = -\frac{1}{3}(x + 3) \text{ Sue}$$

$$y - 4 = -\frac{1}{3}x - 1$$

$$y = -\frac{1}{3}x + 3 \text{ Kathy}$$

What is the equation to the following line?



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

Point-Slope Form:

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

$$y - 3 = -\frac{2}{5}(x - 0)$$

or

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

or

equivalent answer

Slope-Intercept Form:

$$y = mx + b$$

$$b = 3 \quad m = -\frac{2}{5}$$

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

Standard Form:

$$Ax + By = C$$

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

$$5y = -2x + 15$$

$$2x + 5y = 15$$

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Classwork: Linear Equations in Different Forms

1) A line that passes through the point $(-9, 12)$ and has a slope of $-\frac{3}{4}$. Find the equation of this line in

all three forms.

$y - y_1 = m(x - x_1)$
a) Point-Slope Form

$$12 - 12 = -\frac{3}{4}(x - (-9))$$

$$y - 12 = -\frac{3}{4}(x + 9)$$

$y = mx + b$

b) Slope-Intercept Form

$$12 = -\frac{3}{4}(-9) + b$$

$$12 = \frac{27}{4} + b$$

$$\frac{21}{4} = b$$

$$y = -\frac{3}{4}x + \frac{21}{4}$$

$Ax + By = C$

c) Standard Form

$$(y = -\frac{3}{4}x + \frac{21}{4}) \cdot 4$$

$$4y = -3x + 21$$

$$3x + 4y = 21$$

2) A line that passes through the points $(-1, -10)$ and $(2, 10)$. Find the equation of this line in all three forms.

a) Point-Slope Form

$$y - 10 = \frac{20}{3}(x - 2)$$

$m = \frac{10 - (-10)}{2 - (-1)} = \frac{20}{3}$

b) Slope-Intercept Form

$$10 = (\frac{20}{3})2 + b$$

$$10 = \frac{40}{3} + b$$

$$b = -\frac{10}{3}$$

$$y = \frac{20}{3}x - \frac{10}{3}$$

c) Standard Form

$$(y = \frac{20}{3}x - \frac{10}{3}) \cdot 3$$

$$3y = 20x - 10$$

$$-20x + 3y = -10$$

3) The two points $(-2, 5)$ and $(4, 8)$ lie on the given line. Which point also lies on the line? (You may solve graphically or algebraically)

~~a) (0, 7)~~

~~b) (6, 8)~~

c) (8, 10)

d) (2, 6)

$$m = \frac{8 - 5}{4 - (-2)} = \frac{3}{6} = \frac{1}{2}$$

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

$$8 = \frac{1}{2}(4) + b$$

$$8 = 2 + b$$

$$6 = b$$

$$y = \frac{1}{2}x + 6$$

$$10 = \frac{1}{2}(8) + 6$$

$$10 = 4 + 6$$

$$10 = 10 \checkmark$$

4) Write the equation of the relation in the following table in all three forms.

x	y
6	96.4
8	89.6
10	82.8
12	76
14	69.2

$$m = \frac{96.4 - 89.6}{6 - 8}$$

$$m = -3.4$$

a) Point-Slope Form

$$y - 76 = -3.4(x - 12)$$

b) Slope-Intercept Form

$$76 = -3.4(12) + b$$

$$76 = -40.8 + b$$

$$116.8 = b$$

$$y = -3.4x + 116.8$$

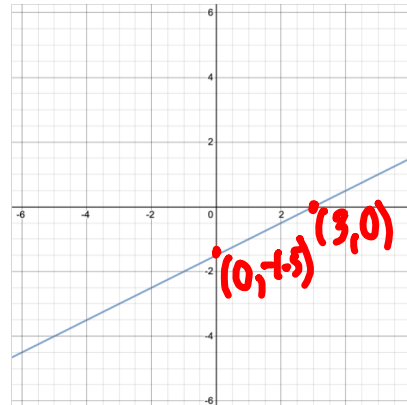
c) Standard Form

$$(y = -3.4x + 116.8) \cdot 5$$

$$5y = -17x + 584$$

$$17x + 5y = 584$$

5) What is the equation to the following line in all three forms?



$$m = \frac{0 - (-1.5)}{3 - 0} = \frac{1.5}{3}$$

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

a) Point-Slope Form

$$y - 0 = \frac{1}{2}(x - 3)$$

b) Slope-Intercept Form

$$y = \frac{1}{2}x - 1.5$$

c) Standard Form

$$(y = \frac{1}{2}x - 1.5) \cdot 2$$

$$y = x - 3$$

$$-x + y = -3$$

6) Latrell and Patrick were doing their algebra homework. They were asked to write the equation of the line that passes through the points $(-5,8)$ and $(10,2)$. Latrell wrote $y = -\frac{1}{5}x + 6$ and Patrick wrote the equation $y + 8 = -\frac{1}{5}(x - 5)$. Who is incorrect? Explain your reasoning.

$$m = \frac{2-8}{10-(-5)} = \frac{-6}{15} = -\frac{2}{5}$$

Well the slope is $-\frac{2}{5}$ so they are both incorrect.

7) In 2013, the United States Postal Service charged \$0.46 to mail a letter weighing up to 1 oz. and \$0.20 per ounces for each additional ounce. Which function would determine the cost, in dollars, y , of mailing a letter weighing x ounces where x is an integer greater than 1?

~~(1)~~ $y = 0.46x + 0.20$

(2) $y = 0.20x + 0.46$

~~(3)~~ $y = 0.46(x - 1) + 0.20$

(4) $y = 0.20(x - 1) + 0.46$

