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MAKING & USING A STUDY GUIDE for a test

Study Guide Exam-5: Forms of Linear Equations

Study Guide: helps you ① summarize,
② visualize, and analyze ③
concepts learned in class

* Warning: simply making a study guide
does not guarantee you an
A+ on the test.

1 Is the equation linear? Select Yes or No for each equation.

$$-\frac{3}{4}x - \frac{1}{2}y = 2$$



Yes



No

$$y = x^2 - 5$$



Yes



No

$$-\frac{2}{x} = y + 12$$



Yes



No

- A linear equation in one variable is an equation that can be written in the form $ax + b = c$
Where a , b , and c are real numbers and $a \neq 0$

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2 Consider the equation $2x - \frac{3}{5}y = -6$. Determine if each statement is True or False.

Solve for y

$$\begin{array}{r|l}
 2x - \frac{3}{5}y = -6 & \\
 -2x & -2x \\
 \hline
 -\frac{3}{5}y & (-2x - 6) \\
 \hline
 y & = \frac{-5}{3}(-2x - 6) \\
 \hline
 y & = \frac{10}{3}x + 10
 \end{array}$$

SOLVE FOR X

$$\begin{array}{r|l}
 2x - \frac{3}{5}y = -6 & \\
 +\frac{3}{5}y & +\frac{3}{5}y \\
 \hline
 2x & \frac{3}{5}y - 6 \\
 \hline
 x & = \frac{3}{5}\left(\frac{1}{2}\right)y - 3 \\
 \hline
 x & = \frac{3}{10}y - 3
 \end{array}$$

The y-intercept is 10.

True False

It is equivalent to $x = \frac{3}{10}y - 3$.

True False

It is equivalent to $y = \frac{10}{3}x + 10$

True False

3 A line is represented by the equation $y - 5 = 6\left(x + \frac{1}{2}\right)$.

Does the statement describe the line? Select Yes or No for each statement.

Solve for y

$$\begin{array}{r} y - 5 = 6x + 3 \\ +5 \qquad +5 \\ \hline y = 6x + 8 \end{array}$$

The slope of the line is -6 . Yes No

$\left(-\frac{1}{2}, 5\right)$ is a point on the line. Yes No

The y-intercept of the line is 3. Yes No

4

Enter $5x = -2y + 6$ in slope-intercept form, then graph the line. Complete the explanation of how you graphed the line.

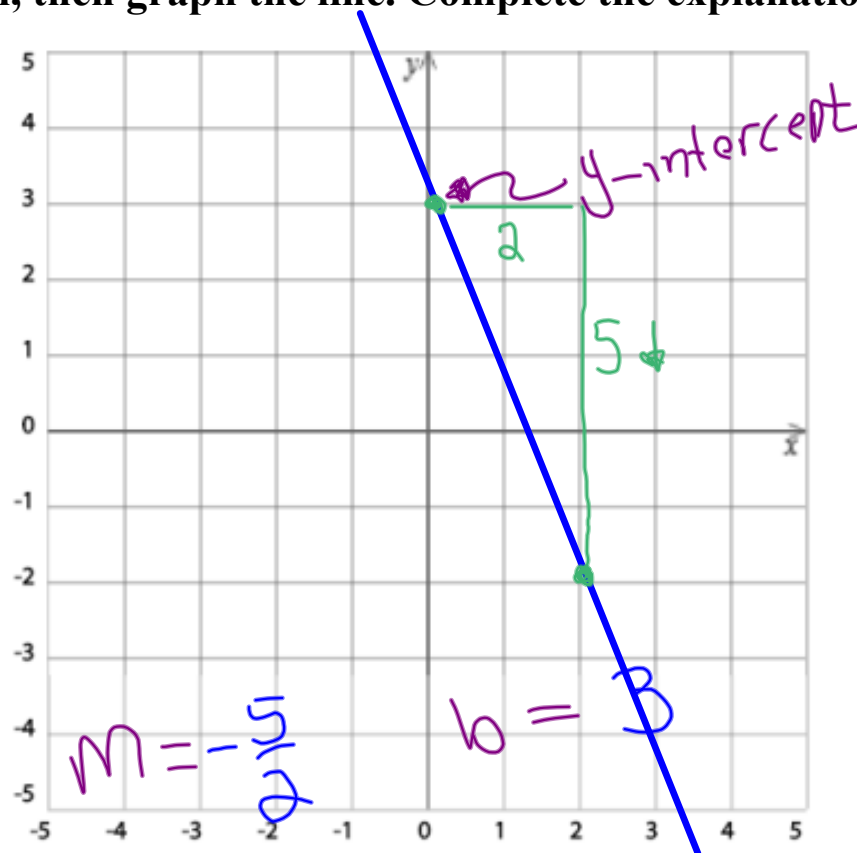
Solve for y

$$5x = -2y + 6$$

$$5x - 6 = -2y$$

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

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



I plotted a point at the y-intercept, $(0, 3)$. I then used the slope to move 5 units down and 2 units to the right and find another point on the line. I connected these points to draw the line.

5 Write an equation for the line in the given form.

slope is ^m-5 and ^{x₁, y₁}(2, 6) is on the line; standard form

Use the point-slope form.

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

$$y - 6 = -5(x - 2)$$

$$y - 6 = -5x + 10$$

Simplify.

$$\begin{array}{r|l} 5x & +5x \\ \hline & +6 \\ \hline 5x+y & 16 \end{array}$$

Rewrite in standard form.

Standard Form

A, B, and C are Integers

$$Ax + By = C$$

6 Write an equation for the line in the given form.

Contains the points $(7, 5)$ and $(9, 9)$; slope-intercept form

Use the points to find the slope. The slope formula is $m = \frac{y_2 - y_1}{x_2 - x_1}$.

$$m = \frac{9 - 5}{9 - 7} = \frac{4}{2} = 2$$

$$b = y - mx = 5 - 2(7) = 5 - 14 = -9$$

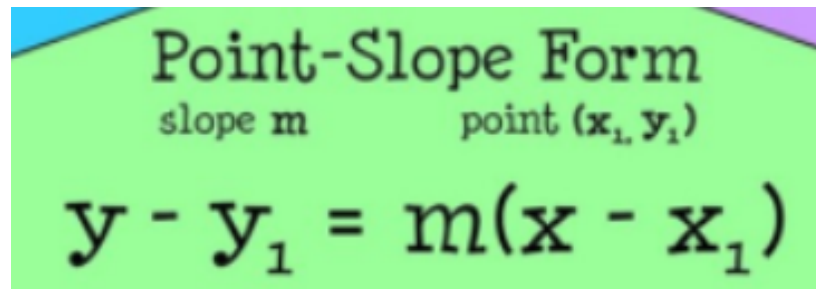
Substitute 2 for m and -9 for b in the equation $y = mx + b$.

The equation of the line is $y = 2x - 9$.

7 Write an equation for the line in the given form.

slope is ^m3 and ^{x_1, y_1} (-7, 7) is on the line; point-slope form

$$y - 7 = 3(x + 7)$$



Point-Slope Form
slope m point (x_1, y_1)
 $y - y_1 = m(x - x_1)$

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8 Look at each equation. Does the equation represent a line with slope $m = 5$, containing the point $(3, 8)$? Select Yes or No for each equation.

$$y - 8 = 5(x - 3)$$

$$\begin{array}{r|l} y - 8 & 5x - 15 \\ + 8 & + 8 \\ \hline y & 5x - 7 \end{array}$$

$$\begin{array}{r} -5x \\ \hline -5x + y = -7 \end{array}$$

Switch sign

$$5x - y = 7$$

$5x - y = 7$
Same



Yes



No

$3x + 8y = 5$
NOT Same



Yes



No

$10x - 2y = 14$
Times by 2 Same



Yes



No

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9

Slope \swarrow \nwarrow y-intercept

Consider the function $f(x) = 3x - 2$. Select True or False for each statement.

The y-intercept is 2.

A

True

B

False

The x-intercept is $\frac{2}{3}$. Set $y=0$, solve for x

A

True

B

False

The slope is 3.

$$\begin{array}{r}
 0 = 3x - 2 \\
 +2 \quad | \quad +2 \\
 \hline
 2 \quad | \quad 3x \\
 3 \quad | \quad \cancel{3} \\
 \hline
 x = \frac{2}{3}
 \end{array}$$

A

True

B

False

Slope-Intercept
slope m y-intercept b

$$y = mx + b$$

11

John has \$8 in his bank account when he gets a job. He begins making \$80 a day. A student found that the equation that represents this situation is $y = 8x + 80$.

What is wrong with the student's equation? Complete the explanation and correct the student's error.

The student the slope and the y-intercept. The slope should be and the y-intercept should be .

The correct equation is .

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Marisa is walking from her home to her friend Sanjay's home. When she is 24 blocks away from Sanjay's home, she looks at her watch. She looks again when she is 8 blocks away from Sanjay's home and finds that 6 minutes have passed.

12

Part 1

What do you need to assume in order to treat this as a linear situation?

- A That Marisa is not walking at a fixed rate.
- B That Marisa is walking at a fixed rate.

Part 2

Identify the variables for the linear situation and identify two points on the line. Explain the meaning of the points in the context of the problem.

Let x represent the number of minutes since Marisa first looked at her watch and y represent the number of blocks she is from Sanjay's home. The point $(0, 24)$ indicates that when Marisa first looked at her watch, she was 24 blocks from Sanjay's home. The point $(6, 8)$ indicates that 6 minutes after she first looked at her watch she was 8 blocks from Sanjay's home.

Part 3

Find the slope of the line and describe what it means in the context of the problem.

$$m = \frac{8 - 24}{6 - 0} = \frac{-8}{3}$$

The slope indicates that for every minute Marisa walks, the distance to Sanjay's home decreases by

$\frac{8}{3}$ blocks.

Part 4

Enter an equation in point-slope form for the situation and use it to find the number of minutes Marisa takes to reach Sanjay's home.

An equation is $y - 24 = -\frac{8}{3}(x - 0)$

Marisa takes 9 minutes to reach Sanjay's home.

13 Juan wrote the equation $y + 1 = 2(x - 3)$ for the line passing through the points $(1, 3)$ and $(2, 9)$. Explain and correct his error.

Juan's error is that he replaced x_1 with y_1

14 Enter an equation in standard form to model the linear situation.

A tank is being filled with gasoline at a rate of 4.1 gallons per minute. The gas tank contained 2.8 gallons of gasoline before filling started.

Let x represent the number of minutes
 y represent the number of gallons of gasoline.

Since 2.8 gallons were in the tank before filling started, the point $(0, 2.8)$ is on the line. The rate is 4.1 gallons per minute, so $m = 4.1$.

Use the point-slope formula

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

$$y - 2.8 = 4.1(x - 0)$$

$$y - 2.8 = 4.1x$$

$$\begin{array}{ccccccc} -4.1x & + & 2.8 & & -4.1x & + & 2.8 \\ \hline \end{array}$$

$$-4.1x + y = 2.8$$

X-term MUST BE POSITIVE



~~$$4.1x - y = -2.8$$~~

15 Enter an equation in standard form to model the linear situation.

A pool that is being drained contained 20,000 gallons of water. After 2 hours, 14,500 gallons of water remain.

- Let x represent the number of minutes
- y represent the number of gallons of water.

- The initial amount of water in the pool was 20,000 gallons, so $(0, 20000)$ is on the line. After 2 hours, the amount of water had decreased to 14,500 gallons, so $(2, 14500)$ is on the line.

- Use the given information to find the slope.

$$m = \frac{14,500 - 20,000}{2 - 0} = \frac{-5,500}{2} = -2,750$$

- Substitute the slope and the coordinates of the first point in the point-slope form.

$$y - 20,000 = -2,750(x - 0)$$

$$y - 20,000 = -2,750x$$

$$\begin{array}{r} 2,750x \\ \hline 2,750x + y = 20,000 \end{array}$$

Note: x -term is positive, don't switch sign

16

Identify the form of each equation.

$9x + 2y = 6$ is in .

*same side
x & y*

$y - 3 = 2(x - 7)$ is in .

$y = 2x + 9$ is in .

$2x - 4y = -9$ is in .

17 Enter the equation in standard form.

$$7(y - 3) = \frac{5}{7}(x - 7)$$

$$7(y - 3) = 5(x - 7) \quad \text{Multiply by 7.}$$

$$\begin{array}{r} 7y - 21 = 5x - 35 \\ -5x \quad + 21 \quad -5x \quad + 21 \\ \hline \end{array}$$

$$-5x + 7y = -14 \quad \text{"switch sign"}$$

$$5x - 7y = 14$$

to max x-term positive

18 Use the information given to enter an equation in standard form.

(9, 12) and (8, 8) are on the line.

Find the slope using the given points. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{8 - (12)}{8 - 9} = \frac{-4}{-1} = 4$$

Substitute the slope and the coordinates of the second point in the point-slope form.

$$y - y_2 = m(x - x_2)$$

$$y - 8 = 4(x - 8)$$

$$y - 8 = 4x - 32$$

Rewrite in standard form.

$$y - 8 = 4x - 32$$

$$\begin{array}{r} -4x \\ \hline -4x + y = -24 \end{array}$$

19 Use the information given to enter an equation in standard form.

$(5, -5)$ and $(2, 4)$ are on the line.

$x_1 \ y_1 \quad x_2 \ y_2$

Find the slope using the given points. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{4 - (-5)}{2 - 5} = \frac{9}{-3} = -3$$

Substitute the slope and the coordinates of the second point in the point-slope form.

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

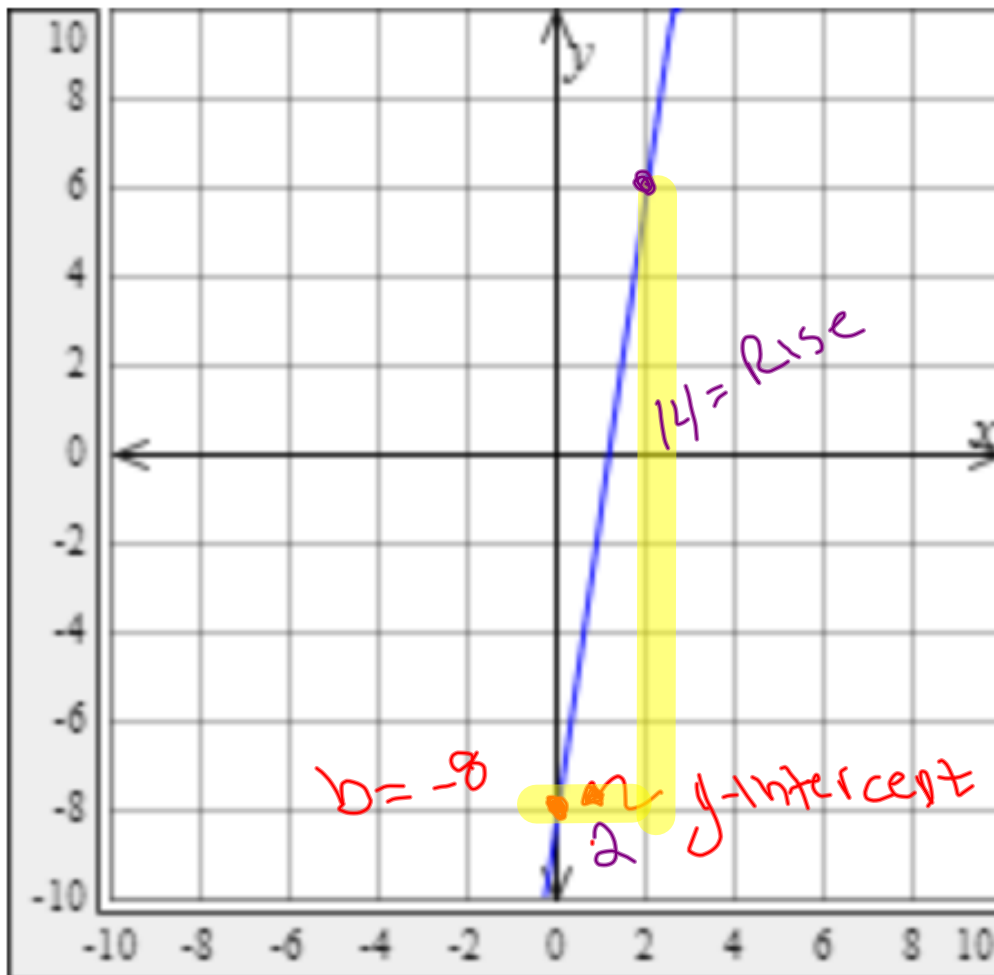
$$y - (-5) = -3(x - 5)$$

$$y + 5 = -3x + 15$$

$$+3x \quad -5 \quad +3x \quad -5$$

$$3x + y = 10$$

20 Use the information on the graph to enter an equation in standard form



$$m = \frac{\text{Rise}}{\text{Run}} = \frac{14}{2} = 7$$

$$y = mx + b$$

$$y = 7x - 8$$

$$\frac{-7x}{-7x}$$

$$-7x + y = -8$$

switch sign

$$7x - y = 8$$

21 Drag and drop each equation in standard form next to an equivalent equation.

$$5y = \frac{3}{5}x + 2.5$$

$$5y = 3x + 10$$

$$-3x + 5y = 10$$

switch sign

$3x - 5y = -10$

$$\frac{-5}{4}x + 1 = y$$

$5x + 4y = 4$

$$4 - y = -8x + 9$$

$$8x - y = 5$$

$8x - y = 5$

$$y - 9 = 7(x - 9)$$

$$y - 9 = 7x - 63$$

$$-7x + y = -54$$

$$7x - y = 54$$

switch sign

$7x - y = 54$

22 Enter an equation in point-slope form for the line.
(4, 1) and (5, 3) are on the line.

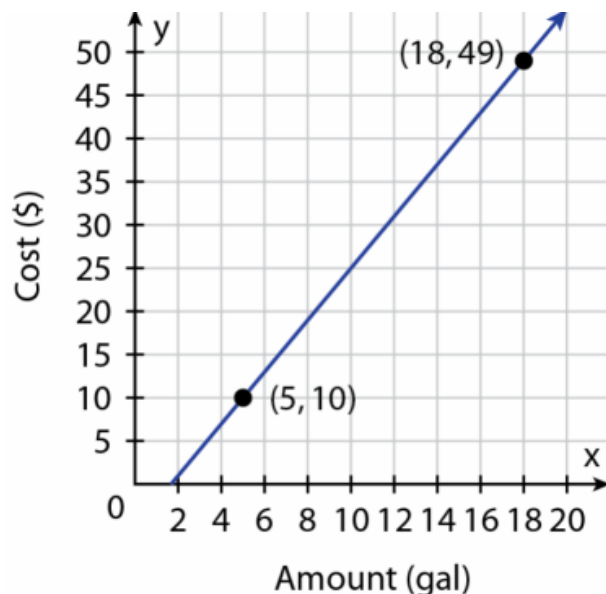
$$\begin{array}{l} \text{Let } (4, 1) \text{ and } (5, 3) \\ (x_1, y_1) \quad (x_2, y_2). \end{array} \quad m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 1}{5 - 4} = 2$$

$$y - y_1 = m(x - x_1) \quad \text{Point-slope form}$$

$$y - 1 = 2(x - 4) \quad \text{Substitute 2 for } m, 4 \text{ for } x_1, \text{ and 1 for } y_1.$$

23

A gas station has a customer loyalty program. The graph shows the amount y dollars that two members paid for x gallons of gas. Use an equation in point-slope form to find the amount a member would pay for 25 gallons of gas.



Slope:

$$m = \frac{49-10}{18-5} = 3$$

Next choose one of the points and find an equation of the line in point-slope form.

Equation using (5, 10):

$$y - y_1 = m(x - x_1) \text{ Point-slope form.}$$

$$y - 10 = 3(x - 5) \text{ Substitute 10 for } y_1, 5 \text{ for } x_1, \text{ and 3 for } m.$$

Cost of 25 gallons:

$$y - 10 = 3(25 - 5) \text{ Substitute 25 for } x.$$

$$y - 10 = 60 \text{ Simplify the right side.}$$

$$y = 70 \text{ Solve for } y.$$

A member would pay \$70 for 25 gallons of gas.

24

Drag and drop each equation next to the pair of points used to create the equation.

$$(0, 0), (-7, 7)$$

$$y - 7 = -1(x + 7)$$

Find the slope of each line

$$m = \frac{7 - 0}{-7 - 0} = -1$$

$$(4, 4), (-4, -4)$$

Use one point

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

$$m = \frac{-4 - 4}{-4 - 4} = 1$$

$$(-2, 14), (0, 16)$$

$$y - 14 = 1(x + 2)$$

$$m = \frac{16 - 14}{0 - (-2)} = 1$$

$$(1, 3), (-1.5, 3)$$

$$y - 3 = 0(x - 1)$$

$$m = \frac{3 - 3}{-1.5 - 1} = 0$$

25

Enter the equation in slope-intercept form. Then graph the line described by the equation.

$$\begin{array}{r} 2x + y = 4 \\ -2x \quad -2x \\ \hline y = -2x + 4 \end{array}$$

Slope-intercept form is

y-intercept: $b = 4$

Plot (0,4). Move 2 unit(s) down and 1 unit(s) right to plot a second point.

Draw a line through the points.

