

Block: Algebra Sem 1 Final Rev

1. Cleo noticed that two of the equations below correctly fit the table.

| | | | | | | | |
|---|----|----|----|----|---|---|----|
| x | -4 | -3 | -2 | -1 | 0 | 1 | 2 |
| y | 11 | 9 | 7 | 5 | 3 | 1 | -1 |

- 1) $y = -3x - 1$ 2) $y = -(2x - 3)$ 3) $y = -2x + 3$ 4) $y = x - 7$

a. Which two fit? Explain how you made your decision.

The slope and y-int.

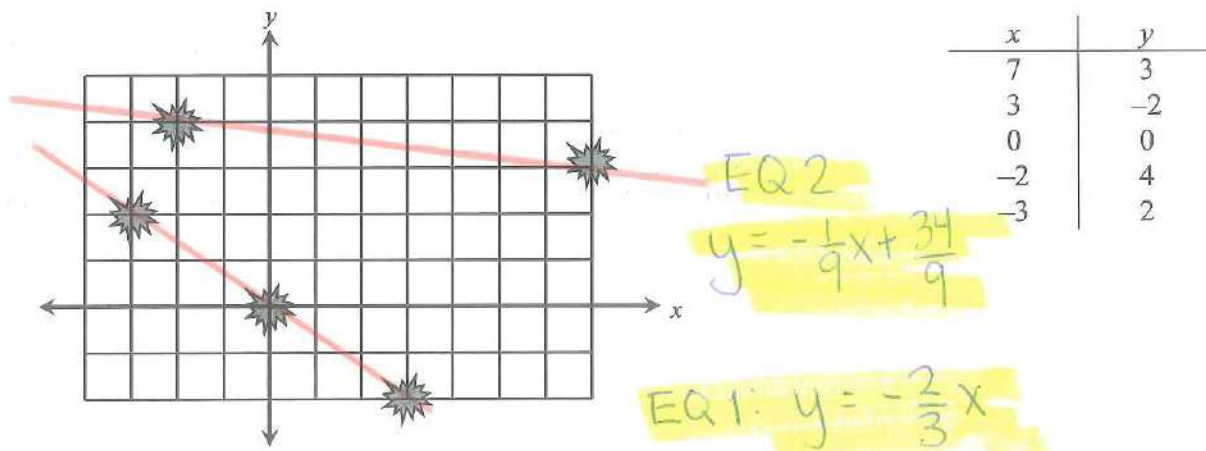
b. Explain why it makes sense that a table can have two rules?

There are different equivalent versions

2. Fill in the blank with $>$, $=$, or $<$ to make the statement true: $4 \times 10^{-8} \square 4 \times 10^{-9}$.

3. Fill in the blank with $>$, $=$, or $<$ to make the statement true: $2 \times 10^7 \square 9.9 \times 10^6$.

14. In the game of "Save the Earth" algebraic equations are used to eliminate meteors. If the equation goes through the coordinate point of the meteor, it is destroyed. Examine the screen shot with meteors on the left and table of values on the right. Your mission is to eliminate the meteors with the fewest equations possible. Write down your equations and draw them on the picture.



15. Use tables, rules (equations), and a graph to find and check the solution for the following problem.

Edda has a poodle that weighs 7 pounds and gains 1 pound per year. Walden has a young sheltie that weighs 2 pounds and gains 1 pound every 6 months. When will the two dogs weigh the same amount?

| | |
|---|----|
| 1 | 8 |
| 2 | 9 |
| 3 | 10 |
| 4 | 11 |
| 5 | 12 |

| | |
|---|----|
| 1 | 4 |
| 2 | 6 |
| 3 | 8 |
| 4 | 10 |
| 5 | 12 |

X = years of poodle
y = weight of poodle

$y = x + 7$

$y = 2x + 2$

In 5 years

16. Examine the following systems of equations. Decide for each system which method would be the most efficient, convenient, and accurate: graphing, substitution, elimination, or the equal values method. Justify your reasons for choosing one strategy over the others. You do not have to solve the systems.

a. $x = -2y + 6$
 $x = 3 - 4y$

EQUAL VALUES

b. $x = 4 - y$
 $y = 3x + 4$

SUBSTITUTION

c. $a + b = 10$
 $3a - 4b = 6$

Elimination

17. A redwood tree in King's Canyon National Park, California has a circumference of 220 inches. Tanner measured the circumference of some other redwoods that had been planted over the last 5 years. His data is recorded below.

| | | | |
|-------------------------|---|-----|---|
| Years since planting | 3 | 4 | 5 |
| Circumference in inches | 4 | 5.5 | 7 |

a. Assuming that the growth rate remains constant, copy and extend the table for the 1st, 2nd, and 6th year.

1st: 1 in

2nd: 2.5 inches

6th: 8.5 in

b. Write a rule for the data in your table.

$y = 1.5x - .5$

c. Use your rule to predict the circumference of a tree after 50 years of growth.

74.5 in

d. Use your rule to estimate the age of the tree with a circumference of 220 inches.

The tree is about 147 yrs old

18. Moe and Larry each need to raise \$200 to go on a trip with their school band. Moe has \$35 in savings and earns \$20 per week delivering papers. Larry has \$60 in savings and earns \$10 per week doing yard work.

a. Use at least two different methods to find the time (in weeks) when Moe and Larry will have the same amount of money in their savings accounts.

2.5 weeks they will both have \$85

b. How long will each boy have to work to have enough money for the trip?

Moe will need to work 8.25 weeks; Larry needs to work 14 wks

19. Pearl solved a system of equations using substitution. Did she do it correctly? How do you know? If she did not, find her error and solve the system correctly.

System: $y = -5 - x$
 $2x + y = 20$

Pearl's Solution: $2x + (-5 - x) = 20$
 $x - 5 = 20$
 $x - 5 + 5 = 20 + 5$
 $x = 25$
 $x = 25 \quad y = -30$

Yes; I plugged (25, -30) into both equations and they both worked!

20. Gabby solved this system of equations and found the solution to be (25, -10). Is Gabby correct? How do you know? Be clear and complete!

$y = \frac{1}{5}x - 15$
 $3x + 6y = 15$

Yes (25, -10) works in both EQs when plugged in.

21. Solve the following equations for the indicated variable. Show all of your work.

a. Solve for x : $2(x+1) = x+12$

$x=10$

b. Solve for y : $-8x - 2y = -4$

$y = -4x + 2$

c. Solve for m : $4p = 4 + 2(m-p)$

$m = 3p - 2$

d. Solve for x : $y = 4x + 3$

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

22. Solve each of the equations below for y . For each equation, state the growth and the y -intercept.

a. $y + 3x = 8x - 7$ $y = 5x - 7$

b. $-6x + 5y = -3(2 - y)$ $y = 3x - 3$; $m=3$; $b=-3$

c. $x(x+5) + y = (x+2)(x-2)$ $m=5$; $b=-7$

d. $-2x - 3y + 1 = -x - 4y + 4$ $y = x + 3$; $m=1$; $b=3$

23. On a recent online math quiz, Leonhard faced the question: "True or false: $(a+b)^2 = a^2 + b^2$." Leonhard quickly typed in "false", and the screen promptly showed "Congratulations! You are correct! So if it doesn't equal $a^2 + b^2$, what does it equal?"

Now Leonhard was stumped. Help him out: what does it equal, and how do you know? Be clear so Leonhard can understand this question.

24. Solve for x using any method you prefer. Check your solutions by testing them in the original equation.

a. $|12 - 7x| = 26$

$\{-2, \frac{38}{7}\}$

b. $|2(x - 3)| = 14$

$\{-4, 10\}$

c. $-3|5 - 2x| = -12$

$\{\frac{1}{2}, \frac{9}{2}\}$

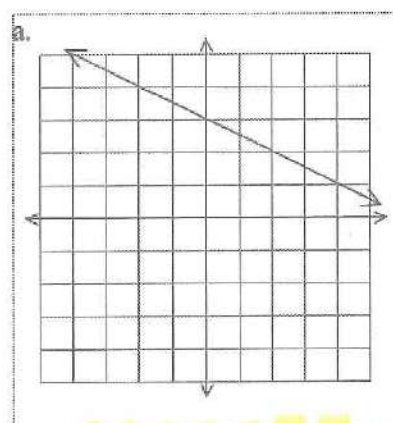
25. The points $(2, 3)$ and $(6, 11)$ lie on a line. Show your work when answering the following questions.

a. What is the growth rate of this line? 2

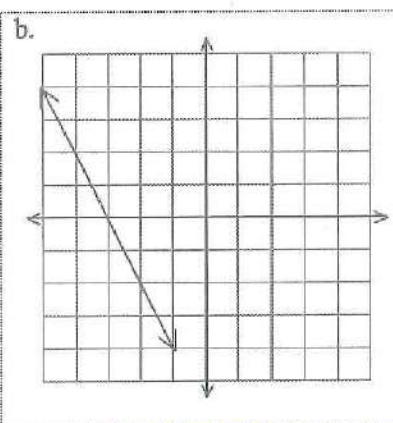
b. What is the y -intercept? -1

c. What is the equation of the line? $y = 2x - 1$

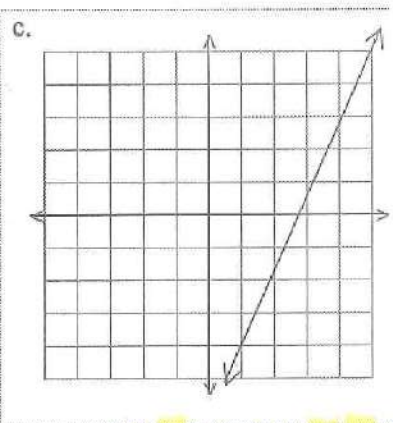
26. What is the equation of each of these lines?



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



$y = -2x - 6$



$y = \frac{9}{4}x - \frac{25}{4}$

27. A new student has joined your study group. Write step-by-step explanations telling her how to use algebra to find the equation of a line given each of the following. Be sure to include examples.

a) A point and the slope. (1) Plug the slope and point into: $y = m(x - x_1) + y_1$

b) Two points. (1) Find slope $m = \frac{y_2 - y_1}{x_2 - x_1}$
 (2) Plug the slope and point into: $y = m(x - x_1) + y_1$

28. Without graphing, find the equation of the line that passes through the points $(-4, 3)$ and $(6, -2)$. Show all work in a clear and organized manner.

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

29. Show and explain how to find the equation of the line that passes through the points $(-4, 8)$ and $(5, -1)$.

$$y = -x + 4$$

30. Consider the line containing the points $(-1, 3)$ and $(4, 6)$.

a. Find the slope of the line. $m = \frac{9}{5}$

b. Find the y-intercept. $b = \frac{24}{5}$

~~c.~~ Find another point on the line that has integer coordinates. Write the coordinates of the point you found.

d. Write an equation for the line. $y = \frac{9}{5}x + \frac{24}{5}$

31. For each situation below, write the equation of the situation described.

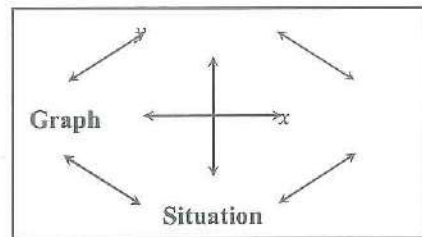
a. A line through the points $(-12, 3)$ and $(8, 15)$. $y = \frac{3}{5}x + \frac{51}{5}$

b. A line with a slope of 4 and a y-intercept of 0.4. $y = 4x + 0.4$

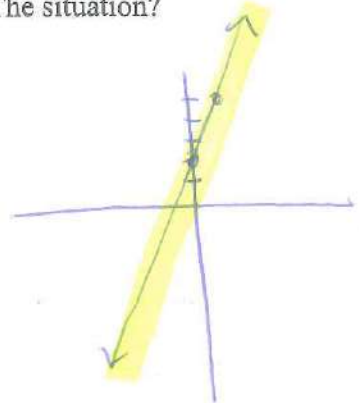
c. For her birthday, Louise got \$100 from her Grammy, but she has been spending \$10.00 each week.

d. A line has intercepts of $(-6, 0)$ and $(0, -12)$. $y = -2x - 12$

32. If $y = 3x + 2$ is the equation in the web at right, create the corresponding remaining components of the web. That is, what is the table? What is the graph? The situation?



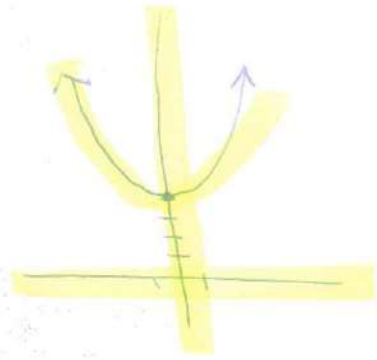
| x | y |
|---|----|
| 0 | 2 |
| 2 | 8 |
| 4 | 14 |



If Sam has 2 problems done and she solves 3 more problems every minute, how many problems has she finished in terms of minutes

33. Complete the table below for the rule $y = x^2 + 4$.

| | | | | | | | |
|---------|----|----|----|---|---|---|----|
| x (in) | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| y (out) | 13 | 8 | 5 | 4 | 5 | 8 | 13 |



- Plot the points and connect them on a complete graph.
- What does your graph look like? Why does it take this shape?

When we have x^2 in the EQ \rightarrow it will make a parabola.

34. Use your pattern-detection skills to find a rule for the table below.

| | | | | | | |
|---|---|----|---|---|----|----|
| x | 2 | -1 | 3 | 0 | -3 | |
| y | 5 | -1 | 7 | 1 | | -2 |

- Copy and complete the table.
- Describe how you see the pattern.
- What is the rule? Write the rule using words.
- How can you tell that your rule is correct?

Hint: put the points in order

We added 2 for each increase of 1x.

$$y = 2x + 1$$

Plug in points to check.

35. Mariela graphed all of the equations below but forgot which equation went with which graph. Help her match each equation with the appropriate graph. Discuss the answers with your group and write a few sentences explaining how you figured it out.

$$y = x - 3$$

d

$$y = -2x + 1$$

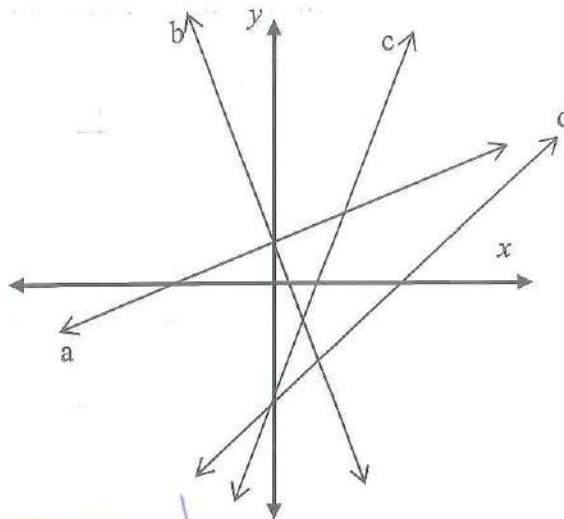
b

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

a

$$y = 2x - 3$$

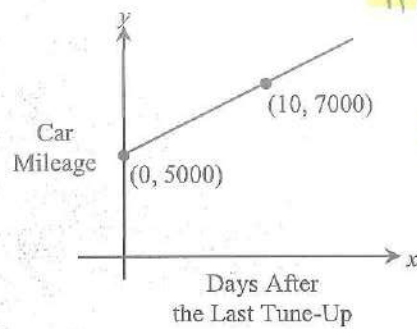
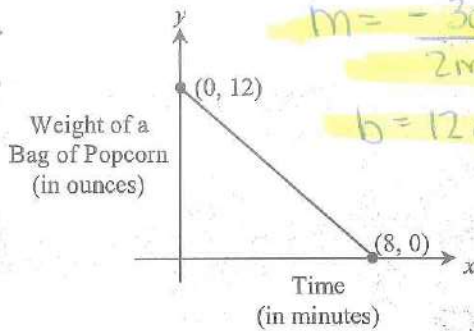
c



Use slopes to compare!

36. Examine the graphs below and explain what real-world quantities the slope and y -intercepts represent. Then find the slope and y -intercept for each.

a.



37. For weeks now, Jeremiah has been collecting data. Every car he comes across, he measures the car's width and the car's length. He graphs this data, and writes the equation of a line he thinks best fits the data. With his graph and equation complete, he proudly boasts "Give me the width of ANY car and I can tell you, exactly, the length of that car!"

What do you think? Can Jeremiah give the exact length of the car? Explain completely.
 No... lines of best fit are just estimates. Some real values will be more or less than the prediction.

38. Starting in 1960, certain agencies began monitoring life expectancy in the U. S. That first year, the average woman was expected to live to be 73.23 years old.

After several years, these agencies came up with an equation, $y = 0.23x + 73$, to give the average lifespan of a U.S. woman in any year after 1960.

a. Given this model, determine the life expectancy of an average woman for the next five-decade years: 1970, 1980, 1990, 2000, and 2010?
 1970 - 75.3 yrs ; 1980 - 77.6 yrs ; 1990 - 79.9 yrs ; 2000 - 82.2 yrs ; 2010 - 84.5 yrs

b. In the equation, what are the real world interpretations of the slope and y -intercept? Be clear and complete.
 0.23 represents the increase in lifespan each year.
 73 represents the initial age when the study began

c. What does the model predict to be the life expectancy of an average woman in the year 2025? How did you get your answer?
 87.95 yrs (Plug in 65)

d. Rate this model: do you think it seems reasonable?
 Only for years close to 1960; Extrapolation (going beyond the data is not reliable.)

39. Does your social networking affect your social life? When analyzing data relating the number of hours a young person spends on social networking sites, x , researchers found the equation of a model, where y is the number of dates the person went on each month, to be $y = 30 - 1.6x$. Interpret the slope and y -intercept for this model
 A person went on 1.6 less dates per month for each hour spent social networking. People who don't use social networks do 30 different things (dates) each month on average.

40. Add or subtract the following polynomials.
 $(8t^2 - 10t + 2) + (8t + 13) = 8t^2 - 2t + 15$

$(x^2 + 5x - 1) - (7x^2 + 2) = -6x^2 + 5x - 3$

$(x^4 + 7x^3 + 7) - (2x^4 - 4x^3 + 1) = -x^4 + 11x^3 + 6$

41. Identify the domain and range for each. Tell if the relation is a function.

h: $\{(3, 1), (2, 4), (3, 5), (4, 8)\}$

a) domain: $\{2, 3, 4\}$

b) range: $\{1, 4, 5, 8\}$

c) function / not a function

j: $\{(2, 7), (3, 6), (4, 5), (5, 4), (6, 3)\}$

a) domain: $\{2, 3, 4, 5, 6\}$

b) range: $\{3, 4, 5, 6, 7\}$

c) function / not a function

k: $\{(1, 2), (2, 3), (3, 2), (4, 1)\}$ ~~H4~~

a) domain: $\{1, 2, 3, 4\}$

b) range: $\{1, 2, 3\}$

c) function / not a function

m: $\{(4, 5), (4, 2), (4, 1), (4, 3), (1, 6)\}$

a) domain: $\{1, 4\}$

b) range: $\{1, 2, 3, 5, 6\}$

c) function / not a function

42. Find the indicated outputs for the following functions.

$f(x) = -4x^2 - 2$

$g(x) = -|x - 3| + 6$

$h(x) = 3x + 7$

a) $f(1) = -6$ b) $g(-2) = 1$ c) $f(-3) = -38$ d) $h(0) = 7$

e) $g(x) = 3; x = \{0, 6\}$ f) $h(x) = 8; x = \frac{1}{3}$ g) $h(x) = 28; x = 7$

43. Find the Slope of:

a) line containing $(4, 8)$ and $(-3, 9)$

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

b) $y = \frac{1}{2}x - 7$

$\frac{1}{2}$

c) $4x - 2y = 10$

2

44. Classify each function below as linear, exponential, or quadratic. Use mathematics to justify your answers.

| x | y |
|---|----|
| 1 | 2 |
| 2 | 5 |
| 3 | 8 |
| 4 | 11 |

Linear

| x | y |
|---|----|
| 1 | 2 |
| 2 | 5 |
| 3 | 10 |
| 4 | 17 |

Quadratic

| x | y |
|---|----|
| 1 | 2 |
| 2 | 4 |
| 3 | 3 |
| 4 | 16 |

None (if the 3 was 8, it would be exponential)

45. A rectangle has a length that is 6 inches longer than its width. If w represents the width, write an expression, in terms of w , for the area of the rectangle. (Remember to define your variables!)

$w^2 + 6w$

46. A rectangle has a length that is 4 inches shorter than its width. If w represents the width, write an expression, in terms of w , for the area of the rectangle. (Remember to define your variables!)

$w^2 - 4w$

47. Evaluate the expression $(n \cdot 3 + 27 \div 3)$, given $n = 3$.

18

48. Simplify $(5^3 \cdot 6^2 - 5^3 \cdot 3^2) \div (3 + 2)^3$

27

49. Evaluate the expression $16 + 12x - x^3$, when $x = 3$.

25

50. Simplify $(7 \cdot 6^2 - 7 \cdot 3^2) + (4 + 3)$

a.) 27

b.) 243

c.) 189

d.) 261

51. A shipping service charges \$0.43 for the first ounce and \$0.29 for each additional ounce of package weight. Write an equation to represent the price P of shipping a package that weighs x ounces, for any whole number of ounces greater than or equal to 1.

$$P = .29x + .43$$

52. A store that sells gift baskets is having a promotional sale. Customers can make their own fruit baskets to use as gifts. Customers pay \$3.00 for a basket and add \$0.20 per pound for all types of fruit. The cost for a basket containing p pounds of fruit is \$4.30. Which equation could be used to find p , the number of pounds of fruit in this basket?

a.) $3.00 + 0.20p = 4.30$

b.) $(0.20 + 4.30)p = 3.00$

c.) $3.00(4.30 + p) = 3.00$

d.) $0.20 + 3.00p = 4.30$

53. The temperature was x° F. It rose 15° F and is now 39° F. Write and solve an equation to find the original temperature.

$$x + 15 = 39$$

$$\text{Orig temp} = 24^\circ \text{F}$$

54. Gary's cellular phone bill averages \$56.35 per month, based on a fixed fee of \$29.95 and \$0.22 per minute of usage. The phone company has decided to reduce the per-minute charge to \$0.18. How much does this change save Gary in an average month? Hint: how many minutes does he use? 120 min

New bill: 51.55

He saves \$4.90

55. You are going to varnish a floor that is 27 ft. by 63 ft. One pint of varnish covers 23 yd^2 of space. How many pints of varnish do you need?

Note: $27 \text{ft} \times 63 \text{ft}$
 $9 \text{yd} \times 21 \text{yd}$

9 pts. needed

56. Find the slope and y -intercept of the line $y = -\frac{1}{6}x + 6$. Is the line parallel to $y = -6x + 6$?

$$m = -\frac{1}{6}$$
$$b = 6$$

No... it is neither // nor \perp

57. The depth of the water in Jeanne's hot tub varies directly with the number of minutes that the faucet is turned on. At 8:15 A.M. Jeanne started filling her circular hot tub with water. At 8:59 A.M. there was a foot of water in the tub. When will the hot tub have $2\frac{3}{4}$ feet of water in it? \rightarrow Takes 121 min

a.) 11:15 A.M.

b.) 10:59 A.M.

c.) 10:15 A.M.

d.) 10:16 A.M.

58. Find the x and y intercepts of the following:

a) $3x - 5y = 18$ $X: (\frac{18}{3}, 0)$ $Y: (0, -\frac{18}{5})$

b) $y = 2x + 9$ $X: (-\frac{9}{2}, 0)$ $Y: (0, 9)$

c) $x = -34$ $X: (-34, 0)$ $Y: \text{NONE}$

59. Describe the graph of $y = 14$

It is horizontal!

60. Are the following lines perpendicular, parallel or neither?

opp. -1 is the reciprocal of 1

a) $y = x + 5$
 $x + y = 14 \rightarrow y = -x + 14$

\perp (perpendicular)

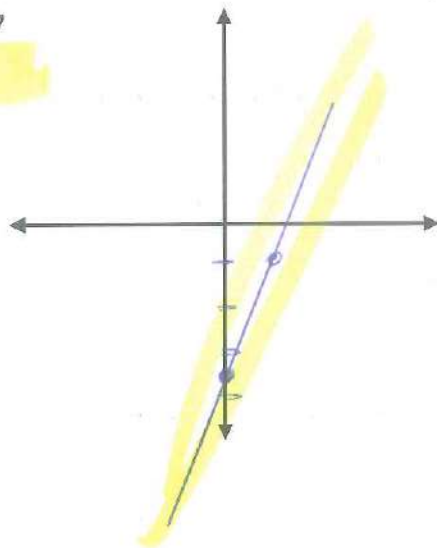
b) $5x - 4y = -8 \rightarrow y = \frac{5}{4}x + 2$
 $8x + 10y = 20 \rightarrow y = -\frac{4}{5}x + 2$

Perpendicular

61. Rewrite the equations in slope-intercept form and graph the line.

a.) $5x - 2y = 7$

$y = \frac{5}{2}x - \frac{7}{2}$



b.) $3x - y - 2 = 0$

$y = 3x - 2$

