6 - Linear & Non-Linear Graphing

December 3, 2018 10:48 AM

6) linear & non-linear graphing

can be a function... or not

	Linear Equations	Non-Linear Equations
Shape of Graph	Line ④ ⊖ ↕ ↔	not a line ∪ ○
Variables Present	x, y or both	⟸ same
Exponents on Variables	x and y both have exponents = 1	x OR y have exponents not equal to 1 ~~ex.~~
Examples	$y = \frac{1}{2}x + 10$	$y = x^2$
	$x = 4$	$y^3 = x$
	$2x + 3y = -4$	$y = \sqrt{x} \cong y = x^{1/2}$

$\sqrt{x} = x^{1/2}$

① ② → x-int and y-int ③ $y = mx + b$

Example #1: Graph the following relations (using any method you choose: table of values, intercepts, or slope), and circle whether they are linear or non-linear.

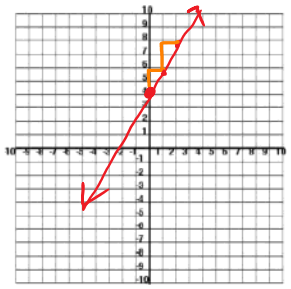
a) $y = 2x + 4$

y-int

Slope: $m = 2 = \frac{2}{1} = \frac{\text{rise}}{\text{run}}$

Method
① Table
② intercepts
③ $y = mx + b$

Linear: YES or NO

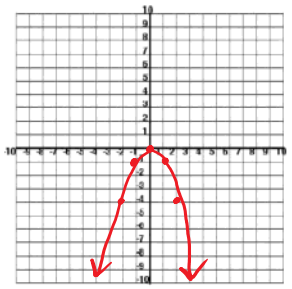


b) $y = -x^2$

① Table of values

x	y	
-2	-4	$y = -(-2)^2$
-1	-1	$y = -(-1)^2$
0	0	$y = -(1)^2$
1	-1	$y = -(2)^2$
2	-4	

Linear: YES or NO



c) $y = 2\sqrt{x} + 5$

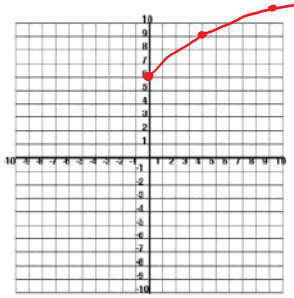
$y = 2x^{1/2} + 5$

x ½

not linear
NOT $y = mx + b$ form

x	y	
-1	ERROR	$y = 2\sqrt{-1} + 5$
0	5	$y = 2\sqrt{0} + 5 = 5$
4	9	$y = 2\sqrt{4} + 5 = 9$
9	11	$y = 2\sqrt{9} + 5 = 11$

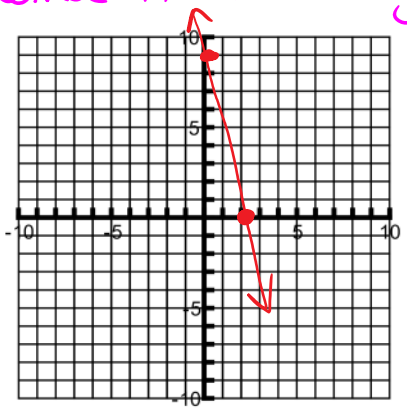
Linear: YES or NO



no exp. ∴ linear relation

*Faster method if NOT in y=mx+b form.

Example #2: Graph the line $9x + 2y = 18$



x-intercept: when y=0

$9x + 2(0) = 18$

$\frac{9x}{9} = \frac{18}{9}$

$x = 2$ (2,0)

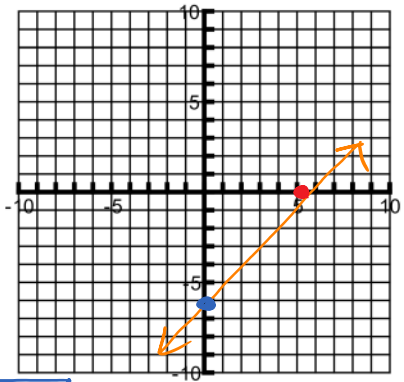
y-intercept: when x=0

$9(0) + 2y = 18$

$\frac{2y}{2} = \frac{18}{2}$

$y = 9$ (0,9)

Example #3: Graph the line $-6x + 5y + 30 = 0$



x-intercept: $-6x + 5(0) + 30 = 0$

$-30 \quad -30$

$\frac{-6x}{-6} = \frac{-30}{-6}$

$x = 5$ (5,0)

y-intercept:

$-6(0) + 5y + 30 = 0$

$-30 \quad -30$

$\frac{5y}{5} = \frac{-30}{5}$

$y = -6$ (0,-6)

Example #4: Determine the intercepts of the following relations. As well, circle whether the relation is linear.

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

x-int: (y=0)

$\frac{x}{3} + \frac{0}{5} = 2$

$\frac{3}{1} \times \frac{x}{3} + 0 = 2 \times \frac{3}{1}$

$x = 6$

(6,0)

y-int: (x=0)

$\frac{0}{3} + \frac{y}{5} = 2$

$\frac{5}{1}(0) + \frac{y}{5} = 2 \times \frac{5}{1}$

$y = 10$

(0,10)

Linear: YES or NO

*plot intercept & connect

b) $y = x^2 - 9$ NOT Linear

x-int: (y=0)

$0 = x^2 - 9$

$+9 \quad +9$

$9 = x^2$

$\pm 3 = x$

$3^2 = 9$

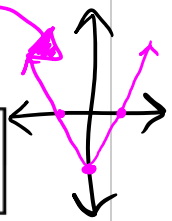
$(-3)^2 = 9$

y-int: (x=0)

$y = (0)^2 - 9$

$y = -9$

Linear: YES or NO



Homework

assignment # 6

pages #11-17 questions #26-63

Graphing Equations: A review from above.

Using a Table of Values:
Step 1: Choose appropriate values of 'x' to put in the table.
Step 2: Input each 'x' into the equation to find the corresponding 'y'.
Step 3: Plot the new-found 'ordered pairs'.
Step 4: Draw a line through the points. (be careful of the shape...not all are lines)

In this unit, we will be studying graphs of straight lines and their equations.

We call these **LINEAR EQUATIONS.**

An equation is said to be ***linear*** if it forms a straight line when graphed.

Equation of a Line Property:

The coordinates of every point on the line will satisfy the equation of the line.

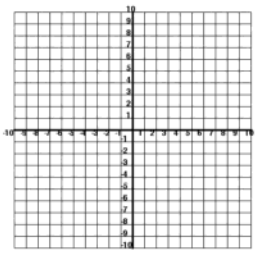
You should REALLY memorize this!

26. How many points do you need to graph a line?

27. To be safe, at least how many should you have?

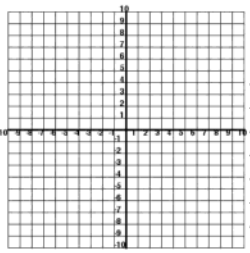
Graph these equations...

28. $y = -3x - 1$



x	y

29. $y = 5 + x$



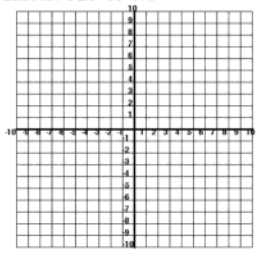
x	y

Graph the following equations, then determine if they are linear or not.

30. $y = -2x - 4$

$y = -2x - 4$	
x	y
-2	
-1	
0	
1	
2	

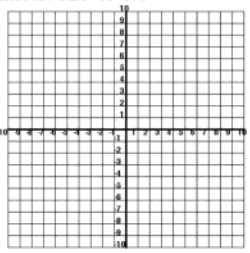
Linear: YES or NO



31. $y = x^2$

$y = x^2$	
x	y
-2	
-1	
0	
1	
2	

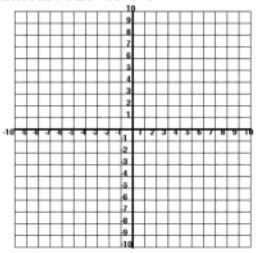
Linear: YES or NO



32. $y = 5x$

$y = 5x$	
x	y
-2	
0	
1	
4	
9	

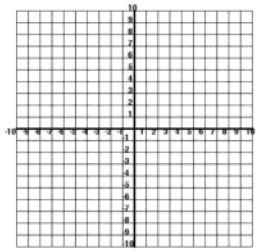
Linear: YES or NO



33. $y = x^3$

$y = x^3$	
x	y
-2	
-1	
0	
1	
2	

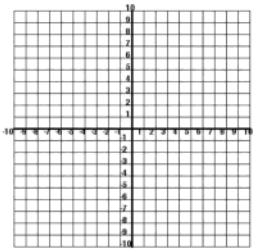
Linear: YES or NO



34. $y = -2x^2 + 6$

$y = -2x^2 + 6$	
x	y
-2	
-1	
0	
1	
2	

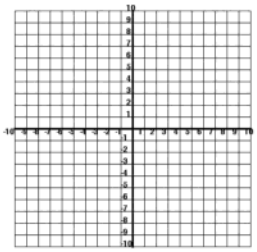
Linear: YES or NO



35. $y = \sqrt{x}$

$y = \sqrt{x}$	
x	y
-2	
-1	
0	
1	
2	

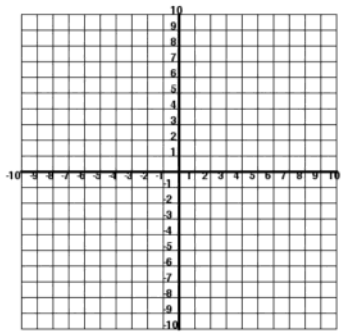
Linear: YES or NO



36. Can you describe a "rule of thumb" that will enable you to tell if an equation represents a linear equation or not?

Challenge #3:

The equation $2x + 4y = 16$ is a **linear equation.**



37. Find the coordinates of the point where the line crosses the y-axis. (Think…what would be the value of 'x' here?)

38. What is the value of '*x*' where the line crosses the y-axis?

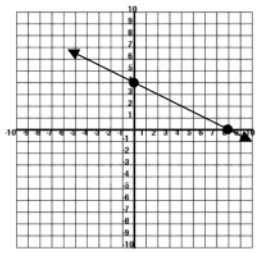
39. Find the coordinates of the point where the line crosses the x-axis.

40. What is the value of "*y*'" where the line crosses the x-axis?

Intercepts

The location where a line passes through the x-axis is called the ***x*-intercept**. This point will have the coordinates $(x, 0)$

The location where a line passes through the y-axis is called the **y-intercept**. This point will have the coordinates $(0, y)$
Consider: $2x + 4y = 16$



This line has an x-intercept at (8, 0).
And a y-intercept at (0, 4).

You may see this written as:
x-intercept is 8
y-intercept is 4

Calculating intercepts from an equation:

The x-intercept will have coordinates $(x, 0)$. This means we can substitute 0 in for y and solve to find the x-intercept. The y-intercept will have coordinates $(0, y)$.

Eg. Find the x-intercept for $2x + 4y = 16$

$2x + 4(0) = 16$
$2x = 16$
$x = 8$

Find the y-intercept: $2x + 4y = 16$

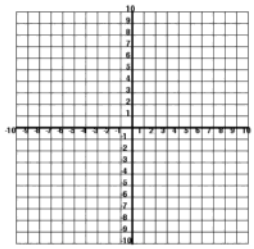
$2(0) + 4y = 16$
$4y = 16$
$y = 4$

Intercepts can be expressed as ordered pairs or simply as values. For the example above, the x-intercept is 8 or the x-intercept is (8,0).

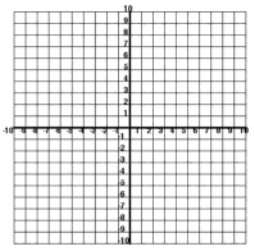
Some notes here...

Calculate the intercepts and graph each equation using them. Fractions can be estimated on the grid.

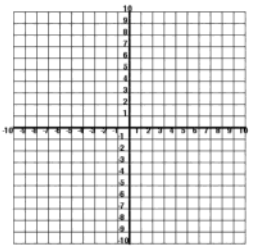
41. $2x + 3y = 12$



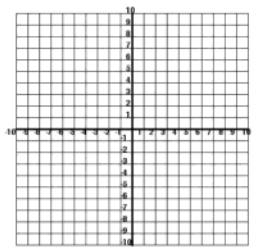
42. $3x + 5y = 30$



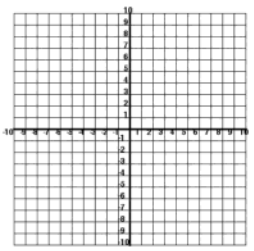
43. $3x - 4y + 24 = 0$



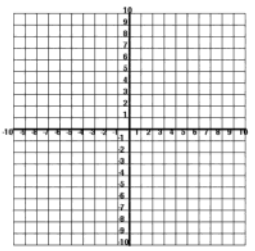
44. $4x + 5y = 20$



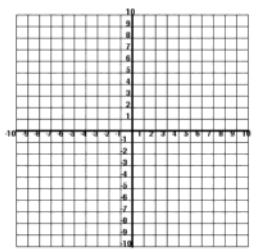
45. $6x - 3y - 18 = 0$



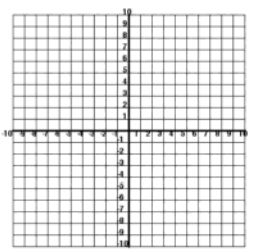
46. $3x - 7y = 21$



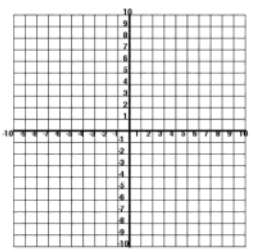
47. $4x + 5y = 10$



48. $9x + 3y - 18 = 0$



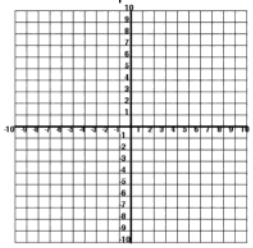
49. $3x - 2y = 9$



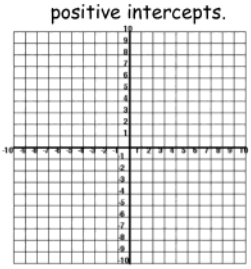
50. When do you think it would be appropriate (or the best scenario) to graph a line using the intercepts as opposed to using some other technique?

Answer the following questions about intercepts and linear relations. For these questions the domain is all real numbers.

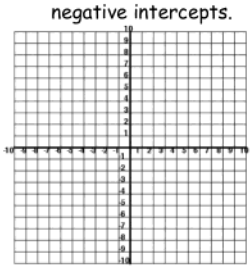
51. Draw a graph of a linear relation that has two intercepts.



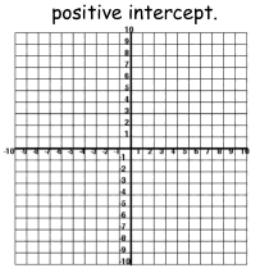
52. Draw a graph of a linear relation that has two positive intercepts.



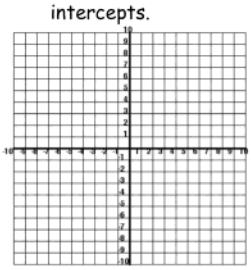
53. Draw a graph of a linear relation that has two negative intercepts.



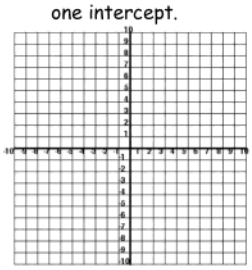
54. Draw a graph of a linear relation that has one negative and one positive intercept.



55. Draw a graph of a linear relation that has an infinite number of intercepts.



56. Draw a graph of a linear relation that has only one intercept.



57. Consider your answer to the previous question. What other **type** of line could you draw that would satisfy the problem?

58. Find the intercepts of the following linear equation.

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

59. Find the intercepts of the following **non**-linear relation.

$$y=x^2-4$$