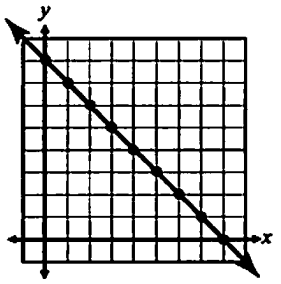
Name: Key	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

Linear Relations

- When points on a graph lie along a **straight line**, it is called a **linear relation**.
- Linear relations can be represented by an **equation**, for example, the equation of this graph can be written as **x + y = 8**.



Standard Form

Linear equations are often written in **standard form:**

$Ax + By = C$

(where A, B, and C are integers and **A ≥ 1** and the **GCF of A, B, and C, is 1**)

Directions: Write each each in **standard form.**

1. $\frac{-5x}{-1} + \frac{6y}{-1} = \frac{-12}{-1}$

$5x - 6y = 12$

2. $y = 2x - 9$

$-2x \quad -2x$

$\frac{-2x}{-1} + \frac{y}{-1} = \frac{-9}{-1}$

$2x - y = 9$

3. $9x + 6y - 24 = 0$

$+24 \quad +24$

$\frac{9x}{3} + \frac{6y}{3} = \frac{24}{3}$ ← GCF!

$3x + 2y = 8$

4. $7y = 7 - 7x$

$+7x \quad +7x$

$\frac{7x}{7} + \frac{7y}{7} = \frac{7}{7}$ ← GCF

$x + y = 1$

5. $\left[\frac{3}{4}x - \frac{1}{3}y = 1\right] \cdot 12$

$9x - 4y = 12$

6. $\left[\frac{1}{6}x = y - 2\right] \cdot 6$

$x = 6y - 12$

$-6y \quad -6y$

$x - 6y = -12$

Slope-Intercept Form

Linear equations are often written in **slope-intercept form:**

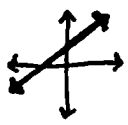
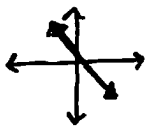
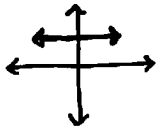
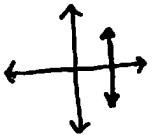
$y = mx + b$ (or) $f(x) = mx + b$

(where **m** is the slope and **b** is the y-intercept)

Slope

Slope is the constant **rate of change** between the points **(think rise/run!)**

There are 4 types of slope. Sketch them below.

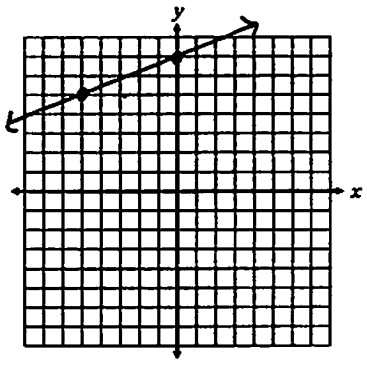
Positive	Negative	Zero	Undefined
			
(Increasing L→R)	(Decreasing L→R)	(Horizontal)	(Vertical)

Directions: Write the equation in **slope-intercept form**, then graph the line.

7. $y = \frac{2}{5}x + 7$

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

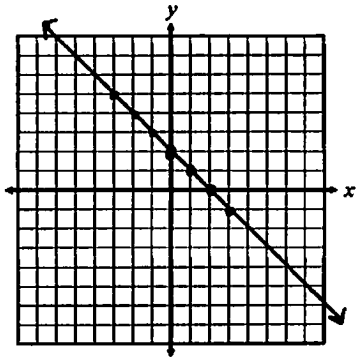
$b = 7$



8. $f(x) = -x + 2$

$m = -1$

$b = 2$



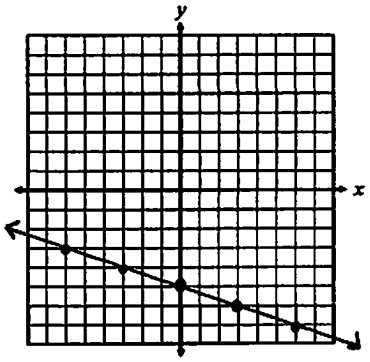
9. $x + 3y = -15$

$3y = -x - 15$

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

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

$b = -5$



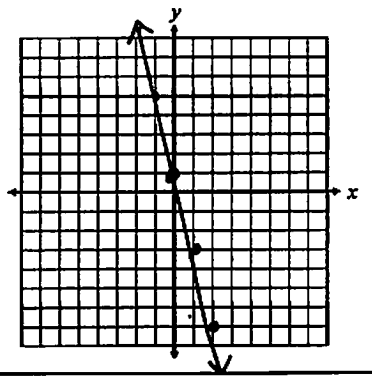
10. $4x + y - 1 = 0$

$4x + y = 1$

$y = -4x + 1$

$m = -4$

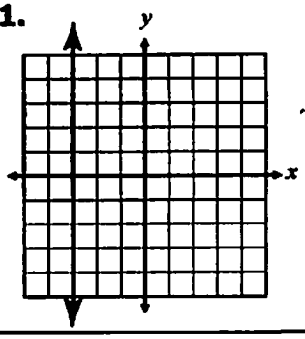
$b = 1$



Vertical & Horizontal Lines

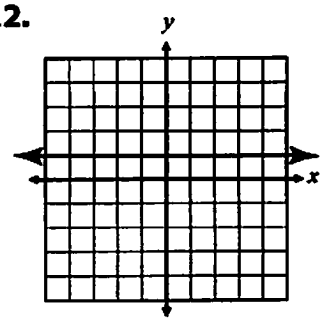
Write each equation to represent the line shown on the graph.

11.



$x = -3$

12.



$y = 1$

Parallel vs. Perpendicular Lines

- The **slopes** of **parallel lines** are equal.
- The **slopes** of **perpendicular lines** are negative reciprocals.

Directions: Determine whether the pair of lines are parallel, perpendicular, or neither.

13. $10x + 5y = 5$ and $-x = 2y + 16$

$5y = -10x + 5$

$y = -2x + 1$

$m = -2$

$-x - 16 = 2y$

$-\frac{1}{2}x - 8 = y$

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

Neither!

14. $8x - 6y = 42$ and $-3y = 9 - 4x$

$-6y = -8x + 42$

$y = \frac{4}{3}x - 7$

$m = \frac{4}{3}$

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

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

$m = \frac{4}{3}$

Parallel!

15. $-8x + 8y = 0$ and $x - y = 4$

$8y = 8x$

$y = x$

$m = 1$

$-y = -x + 4$

$y = x - 4$

$m = 1$

Parallel!

16. $x = 2$ and $y = 2$

m = undef.

$m = 0$

Perpendicular!

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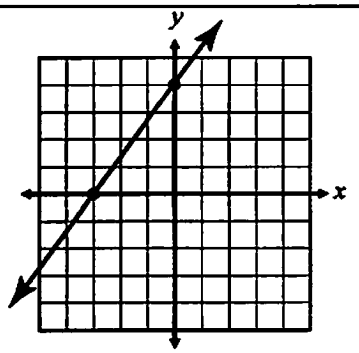
Main Ideas/Questions	Notes/Examples

X- and Y-Intercepts

- The point at which the graph intersects the x-axis is called the **x-intercept.** Likewise, the point at which the graph intersects the y-axis is called the **y-intercept.**
- Identify the x- and y-intercept of the graph shown on the right.



X-int: (-3, 0)

y-int: (0, 4)

The **x-intercept is also refered to as a** root, zero, or Solution to the equation.

Finding Intercepts Algebraically

To find the x-interept of an equation, set y equal to 0 and solve for x.
To find the y-intercept of an equation, set x equal to 0 and solve for y.
You can use these points to graph the equation.

Example: Find the x- and y-intercepts of the equation $y = -2x + 5$

x-int: $0 = -2x + 5$

$-5 = -2x$

$\frac{5}{2} = x$

$(\frac{5}{2}, 0)$

y-int: $y = -2(0) + 5$

$y = 0 + 5$

$y = 5$

$(0, 5)$

Directions: Find the x- and y-intercept of each equation. Then, graph the equation using the intercepts.

1. $y = 5x - 1$

x-int: $0 = 5x - 1$

$1 = 5x$

$\frac{1}{5} = x$

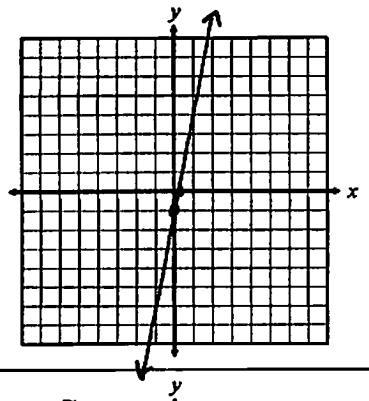
$(\frac{1}{5}, 0)$

y-int: $y = 5(0) - 1$

$y = 0 - 1$

$y = -1$

$(0, -1)$



2. $y = -\frac{6}{5}x + 2$

x-int: $0 = -\frac{6}{5}x + 2$

$0 = -6x + 10$

$-10 = -6x$

$\frac{5}{3} = x$

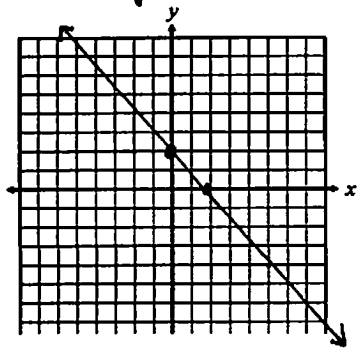
$(\frac{5}{3}, 0)$

y-int: $y = -\frac{6}{5}(0) + 2$

$y = 0 + 2$

$y = 2$

$(0, 2)$



3. $y = -3x + \frac{16}{3}$

X-int: $0 = -3x + \frac{16}{3}$

$0 = -9x + 16$

$-16 = -9x$

$\frac{16}{9} = x$

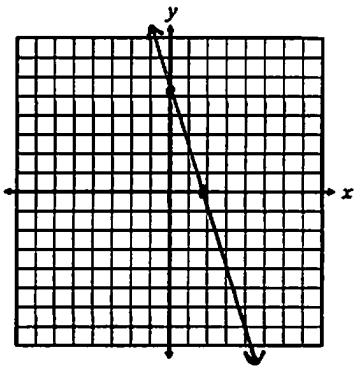
$\left(\frac{16}{9}, 0\right)$

y-int: $y = -3(0) + \frac{16}{3}$

$y = 0 + \frac{16}{3}$

$y = \frac{16}{3}$

$\left(0, \frac{16}{3}\right)$



4. $4x - y = 8$

X-int: $4x - 0 = 8$

$4x = 8$

$x = 2$

$(2, 0)$

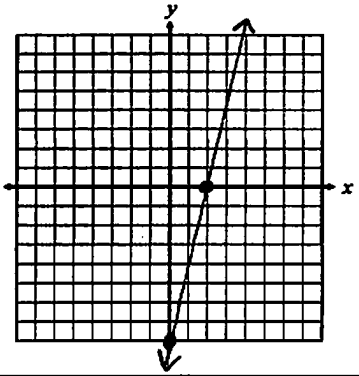
y-int: $4(0) - y = 8$

$0 - y = 8$

$-y = 8$

$y = -8$

$(0, -8)$



5. $-5x - 4y = -24$

X-int: $-5x - 4(0) = -24$

$-5x - 0 = -24$

$-5x = -24$

$x = \frac{24}{5}$

$\left(\frac{24}{5}, 0\right)$

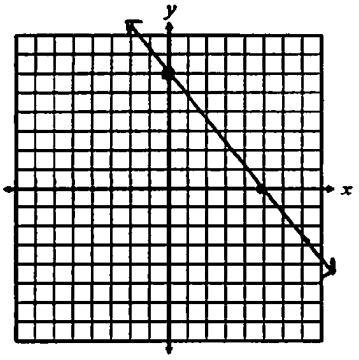
y-int: $-5(0) - 4y = -24$

$0 - 4y = -24$

$-4y = -24$

$y = 6$

$(0, 6)$



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

X-int: $\frac{3}{4}x - \frac{1}{3}(0) = -2$

$\frac{3}{4}x - 0 = -2$

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

$3x = -8$

$x = -8/3$

$(-8/3, 0)$

y-int: $\frac{3}{4}(0) - \frac{1}{3}y = -2$

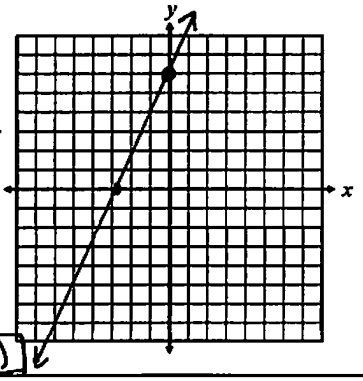
$0 - \frac{1}{3}y = -2$

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

$-1y = -6$

$y = 6$

$(0, 6)$



7. $\frac{5}{2}x + \frac{5}{6}y = 6$

X-int: $\frac{5}{2}x + \frac{5}{6}(0) = 6$

$\frac{5}{2}x + \quad = 6$

$\frac{5}{2}x = 6$

$5x = 12$

$x = \frac{12}{5}$

$\left(\frac{12}{5}, 0\right)$

y-int: $\frac{5}{2}(0) + \frac{5}{6}y = 6$

$0 + \frac{5}{6}y = 6$

$\frac{5}{6}y = 6$

$5y = 36$

$y = \frac{36}{5}$

$\left(0, \frac{36}{5}\right)$