

Slope =  $\frac{\text{rise}}{\text{run}} = m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$   
 $\Delta = \text{change}$

Example 1: What is the rate of change?

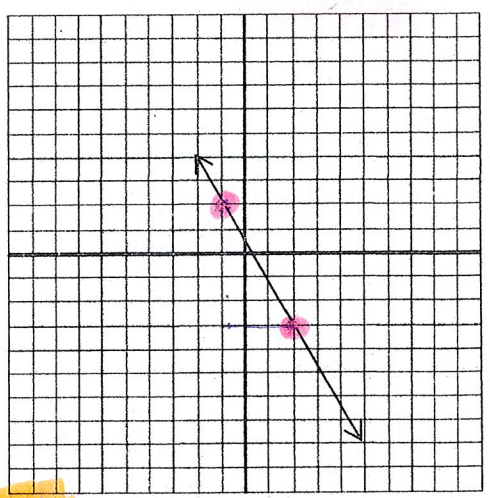
$x_2 - x_1$	X	3	6	9	12	15
$y_2 - y_1$	y	-2	-4	-6	-8	-10

$\frac{\Delta y}{\Delta x} = \frac{-2}{3}$

$-4 - (-2) = -2$   
 $-6 - (-4) = -2$   
 $-8 - (-6) = -2$   
 $-10 - (-8) = -2$

Example 2: What is the rate of change/slope of the line?

$\frac{\text{Fall } 5}{\text{run } 3} = \frac{-5}{3}$



Example #3: Find the rate of change from the points:

A.  $(5, 8) (-5, 3)$   
 $\frac{5}{10} = \frac{1}{2}$

B.  $(-6, -3) (6, 12)$   
 $\frac{-15}{-12} = \frac{5}{4}$

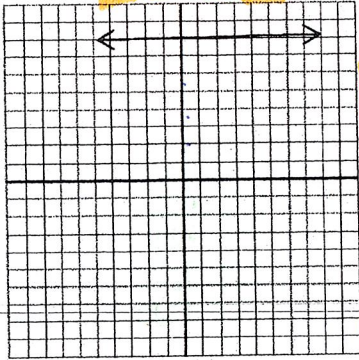
C.  $(5, 4) (5, 8)$   
 $\frac{-4}{0} = \text{undefined}$

D.  $(3, -1) (2, -1)$  -  $\begin{pmatrix} 3 & -1 \\ 2 & -1 \end{pmatrix} \begin{matrix} 0 \\ 0 \end{matrix} = 0$

Example #4: Find the slope of each line:

A.

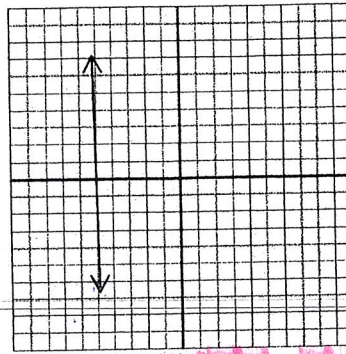
Hoy



h = horizontal  
 0 = slope = 0  
 y = y = #  
 y = 8

m = 0

B.



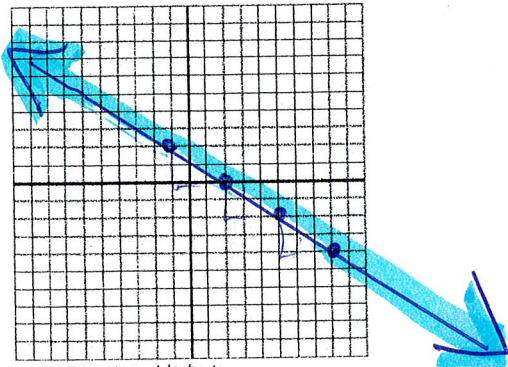
V = vertical  
 u = m = undef.  
 x = x = #  
 x = -5

m = undefined

Example #5: Graph the line that passes through the point with the slope:

A.  $(-1, 2)$  slope =  $-\frac{2}{3}$

① plot ↑    ② down 2 run right 3



B.  $(5, -1)$  slope = 2

① plot ↑    ② 2 up 1 right



⑥  $(2, 4) (x, 8)$      $m = \frac{1}{2}$

-  $\begin{pmatrix} 2 & 4 \\ x & 8 \end{pmatrix} \begin{matrix} -4 \\ 2-x \end{matrix}$

$\frac{-4}{2-x} = \frac{1}{2}$      $\frac{-8}{-2} = \frac{2-x}{-2}$   
 $\frac{-10}{-4} = \frac{-x}{-2}$

x = 10

## 6.2 Notes Slope-Intercept Form

Slope-intercept form

$$y = mx + b$$

$m = \frac{\text{slope rise}}{\text{run}}$

$b = \text{y-int (start here!)}$

Example #1: State the slope and y-intercept:

A.  $y = -x + 5$

$m = \frac{-1}{1}$   
 $b = 5$

B.  $y = -3x$

$m = -3$   
 $b = 0$

C.  $y = -3$

$m = 0$   
 $b = -3$

D.  $y = 4 - \frac{2}{5}x$

$m = -\frac{2}{5}$   
 $b = 4$

Example #2: Write an equation in slope intercept form:

A.  $m = 1, b = 3$

$y = x + 3$

B.  $m = 0, b = -1$

$y = -1$

C.  $m = -\frac{1}{2}, b = 0$

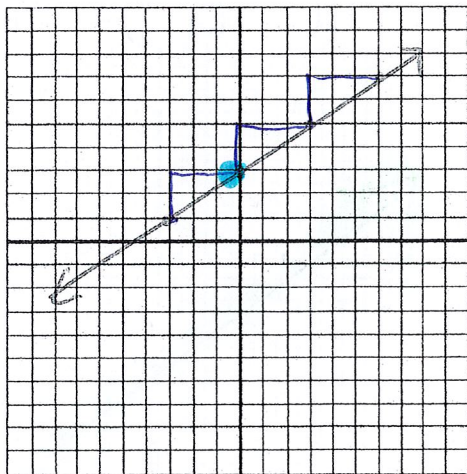
$y = -\frac{1}{2}x$

Example #3: Write an equation in slope intercept form:

A.  $y = \frac{2}{3}x + 3$

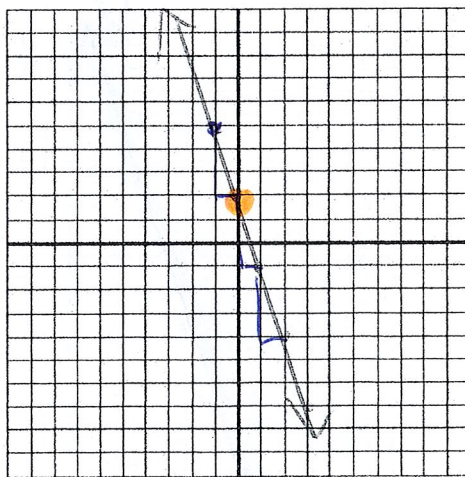
B.  $y = -3x + 2$

C.  $y = 2x - 3$



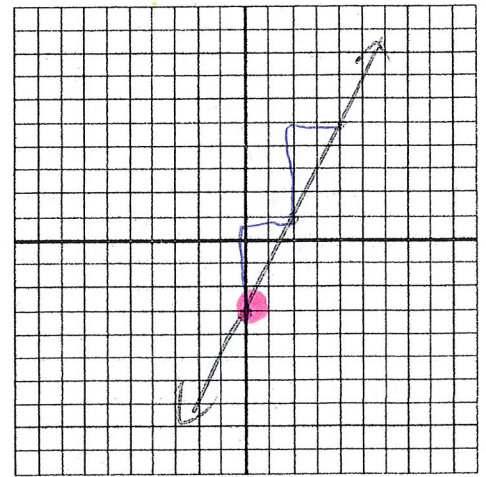
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$m = \frac{2}{3}$   $b = 3$



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$m = \frac{-3}{1} = -3$   
 $b = 2$



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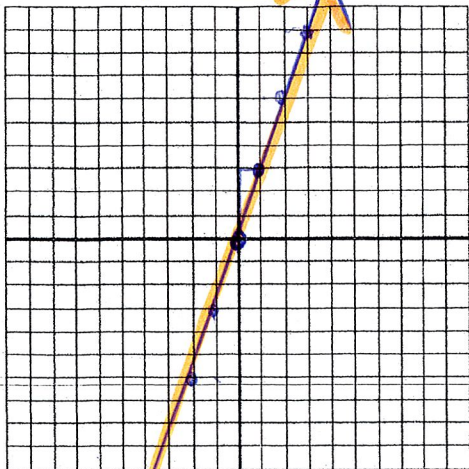
$m = \frac{4}{2} = 2$   
 $b = -3$

no more + 3. 41-55 oadw  
 59.83

Example #4: Graph the lines

A.  $y = 3x$

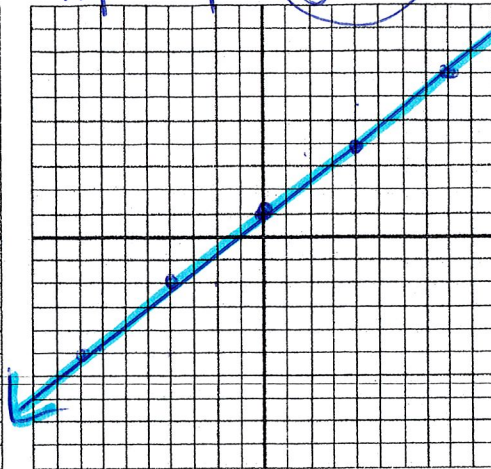
$m = \frac{3}{1}$   $b = 0$  *start here*



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B.  $y = \frac{3}{4}x + 1$

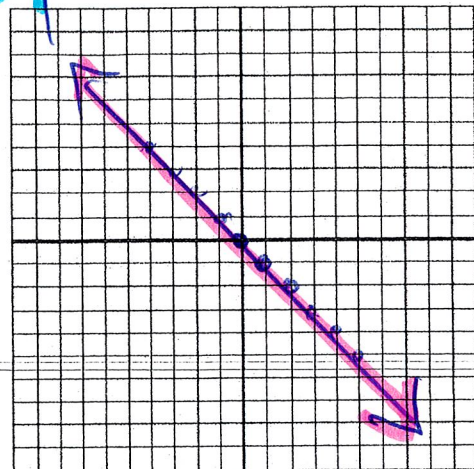
$m = \frac{3}{4}$   $b = 1$  *1 on y-axis*



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C.  $y = -x$

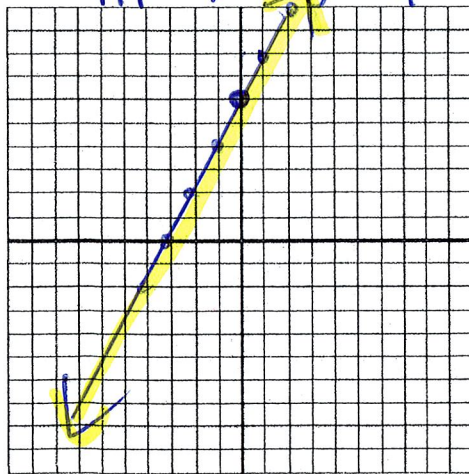
$m = -1$   $b = 0$



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D.  $2y - 12 = 4x$

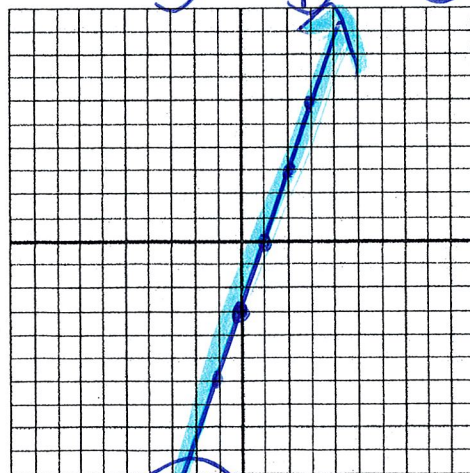
$m = 2$   $b = 6$



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E.  $-3(x - 1) + y = 0$

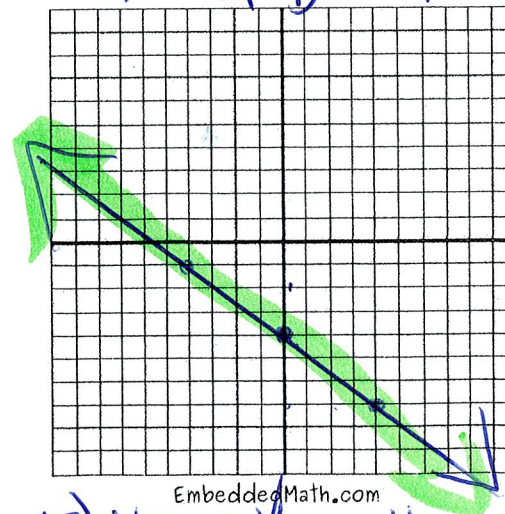
$m = 3$   $b = -3$



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F.  $4y + 3x = -16$

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



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$$\begin{aligned} D) \quad 2y - 12 &= 4x \\ +12 \quad +12 & \\ \hline 2y &= 4x + 12 \\ \frac{2y}{2} &= \frac{4x + 12}{2} \\ y &= 2x + 6 \end{aligned}$$

$$\begin{aligned} E) \quad -3(x - 1) + y &= 0 \\ +3x + 3 + y &= 0 \\ -y - y & \\ \hline -3x + 3 &= -y \\ \frac{-3x + 3}{-1} &= \frac{-y}{-1} \\ 3x - 3 &= y \end{aligned}$$

$$\begin{aligned} F) \quad 4y + 3x &= -16 \\ -3x \quad -3x & \\ \hline 4y &= -3x - 16 \\ \frac{4y}{4} &= \frac{-3x - 16}{4} \\ y &= -\frac{3}{4}x - 4 \end{aligned}$$

6.3 Notes Standard Form

Standard form:  $Ax + By = C$

This form is useful for  $x$  and  $y$  intercepts

$x$ -intercept: where the graph crosses the  $x$ -axis ( $x, 0$ ) plug in 0 for  $y$

$y$ -intercept: where the graph crosses the  $y$ -axis ( $0, y$ ) plug in 0 for  $x$

Example #1: Find the  $x$  and  $y$ -intercepts:

A.  $3x + y = -6$

$$3x + 0 = -6$$

$$\frac{3x}{3} = \frac{-6}{3}$$

$$x = -2 \text{ or } (-2, 0)$$

$$3(0) + y = -6$$

$$y = -6 \text{ or } (0, -6)$$

B.  $-2x + 4y = -8$

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

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

$$x = 4 \text{ or } (4, 0)$$

$$-2(0) + 4y = -8$$

$$\frac{4y}{4} = \frac{-8}{4}$$

$$y = -2 \text{ or } (0, -2)$$

C.  $5x - 6y = -12$

$$5x - 6(0) = -12$$

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

$$x = -2.4 \text{ or } (-2.4, 0)$$

$$5(0) - 6y = -12$$

$$\frac{-6y}{-6} = \frac{-12}{-6}$$

$$y = 2 \text{ or } (0, 2)$$

Example #2: which equation is graphed below?

A.  $3x + 2y = 6$

B.  $2x + 3y = 6$

C.  $x + y = 6$

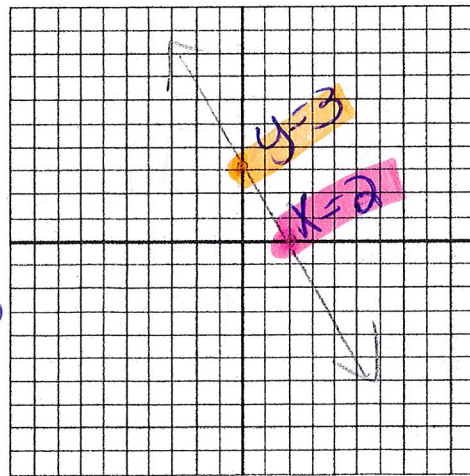
A)  $3x + 2(0) = 6$   $3(0) + 2y = 6$

$$\frac{3x}{3} = \frac{6}{3}$$

$$\frac{2y}{2} = \frac{6}{2}$$

$$x = 2$$

$$y = 3$$



Example #3: Find the x and y intercepts of the equation and graph the line:

A.  $x + 4y = -4$

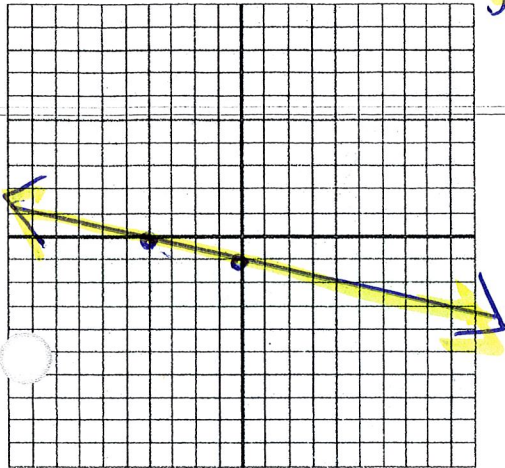
$x + 4(0) = -4$

$x = -4$

$0 + 4y = -4$

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

$y = -1$



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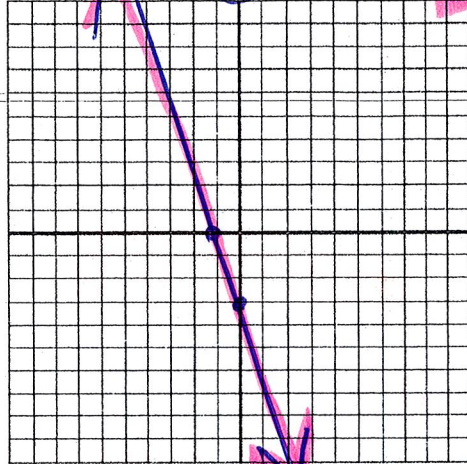
B.  $9x + 3y = -9$

$9x + 3(0) = -9$

$\frac{9x}{9} = \frac{-9}{9}$   $x = -1$

$9(0) + 3y = -9$

$\frac{3y}{3} = \frac{-9}{3}$   $y = -3$



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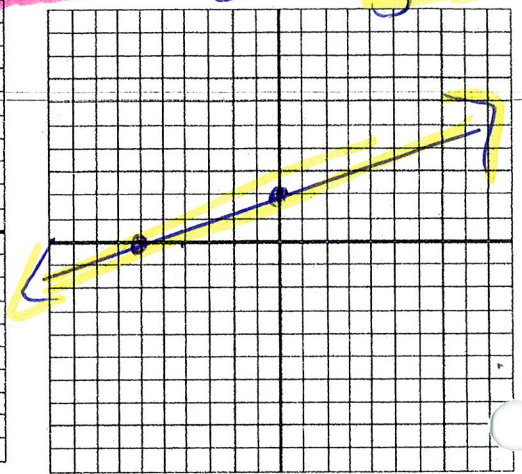
C.  $3y - 6 = x$

$3(0) - 6 = x$

$-6 = x$

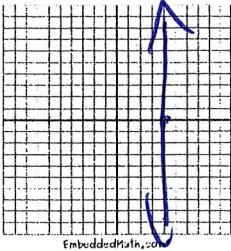
$3y - 6 = 0$   
 $+6 \quad +6$

$\frac{3y}{3} = \frac{6}{3}$   $y = 2$



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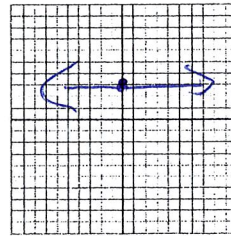
Vertical lines:  $x = h$



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$Vux$   
 $x = 4$

Horizontal lines  $y = k$

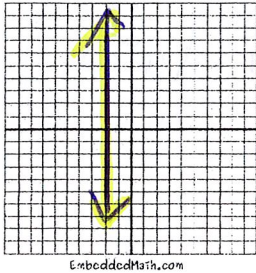


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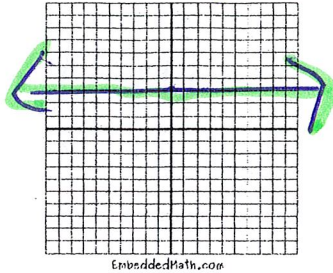
$Hay$   
 $y = 4$

Example #4 Graph the lines:

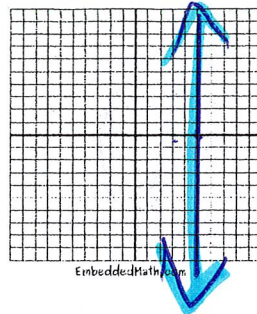
A.  $x = -2$   
 $\text{Vux}$



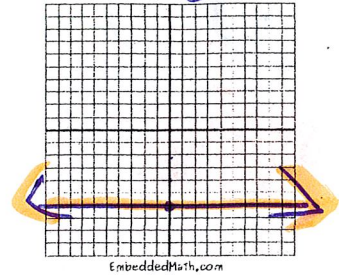
B.  $y = 3$   
 $\text{Hay}$



C.  $x = 5$   
 $\text{Vux}$



D.  $y = -6$   
 $\text{Hay}$



Example #5: Dairy Queen is having a fundraiser at Eppler. Blizzards are \$3.00 each and cones are \$1.50 each. Write and solve an equation to find out how much ice cream treats Hunter can buy if he brings \$12.00 to school.

Blizzards =  $x$   
 cones =  $y$

$$3x + 1.50y = 12$$

$$3x + \boxed{1.50(0)} = 12$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

$$\boxed{3(0)} + 1.50y = 12$$

$$\frac{1.50y}{1.50} = \frac{12}{1.50}$$

4 blizzards, 0 cones

$y = 8$   
 0 blizz.  
 8 cones

Example #6: Write each equation in standard form ( $Ax + By = C$ ) using integers (no fractions or decimals!)

A.  $y = \frac{3}{4}x + 2$   $x$  positive

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

C.  $y + \frac{2}{3} = \frac{1}{4}x$   $12$

$$4y = 3x + 8$$

$$\begin{array}{r} 4y = 3x + 8 \\ -3x \quad -3x \\ \hline -3x + 4y = 8 \end{array}$$

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

$$\begin{array}{r} 5y = -2x + 5 \\ +2x \quad +2x \\ \hline 2x + 5y = 5 \end{array}$$

$$12y + 8 = 3x$$

$$\begin{array}{r} 12y + 8 = 3x \\ -12y \quad -12y \\ \hline 8 = 3x - 12y \end{array}$$

$$-1(-3x + 4y = 8)$$

$$3x - 4y = -8$$

$$2x + 5y = 5$$

$$8 = 3x - 12y$$

# 6.4 Point Slope Form

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

~~$$m = \frac{y_2 - y_1}{x_2 - x_1}$$~~

$$y - 4 = 2(x - 3)$$

$$m = 2 \quad (3, 4)$$

$$y_2 - y_1 = m(x_2 - x_1)$$

Identify the slope and the point that was plugged in to each equation:

$$1. \quad y - 5 = -3(x + 1)$$

$$2. \quad y + 2 = \frac{3}{4}(x - 5)$$

$$3. \quad y = -(x + 3)$$

$$4. \quad y - 2 = 5x$$

$$m = -3 \quad (-1, 5)$$

$$m = \frac{3}{4} \quad (5, -2)$$

$$m = -1 \quad (-3, 0)$$

$$m = 5 \quad (0, 2)$$

Example #1: Graph the equation:

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

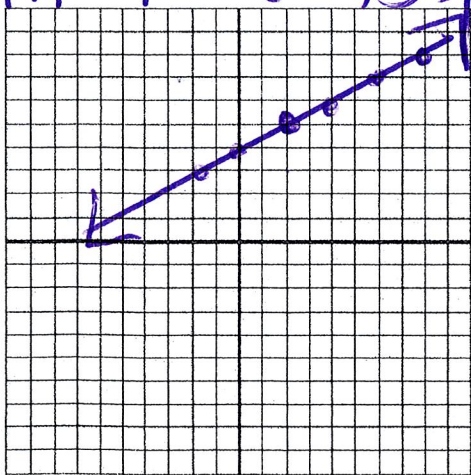
$$B. \quad y + 3 = -2(x + 5)$$

$$C. \quad y + 1 = -\frac{1}{4}(x - 3)$$

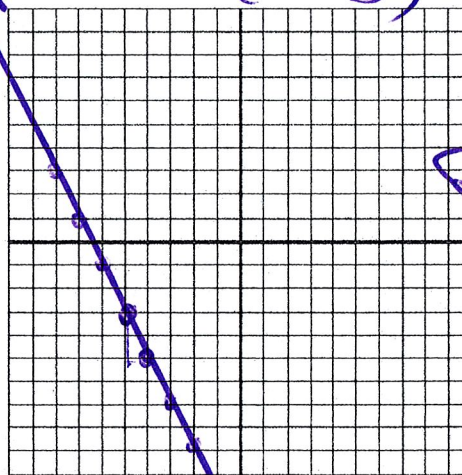
$$m = \frac{1}{2} \quad (2, 5)$$

$$m = -2 \quad (-5, -3)$$

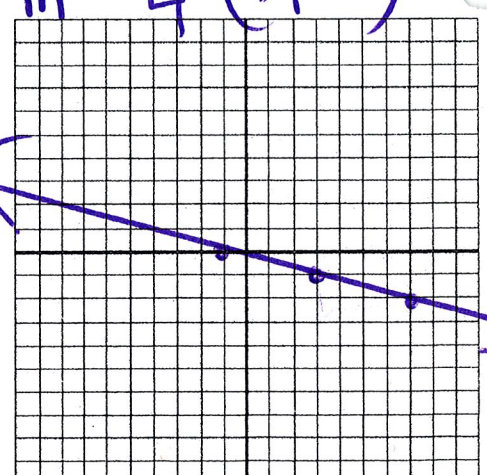
$$m = -\frac{1}{4} \quad (3, -1)$$



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Example #2: Write an equation in point-slope form:

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

A.  $(-1, 7) m = -3$

B.  $(10, -8) m = \frac{2}{5}$

C.  $(-2, 0) m = -1$

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

$$y + 8 = \frac{2}{5}(x - 10)$$

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

Example #3: Write an equation in point slope. Then write it in slope-intercept form.

A.  $(-1, -5) (2, 3)$

$$y - 3 = \frac{8}{3}(x - 2)$$

B.  $(5, 8) (3, -2)$

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

$$\begin{array}{r} (-1, -5) \\ - (2, 3) \\ \hline -8 - 8 \\ -3 3 \end{array}$$

$$\begin{array}{r} y - 3 + \frac{8x - 16}{3} \\ + 8 \\ \hline \end{array}$$

$$\begin{array}{r} (5, 8) \\ - (3, -2) \\ \hline 10 = 5 \end{array}$$

$$\begin{array}{r} y - 8 = 5x - 25 \\ + 8 \quad + 8 \\ \hline y = 5x - 17 \end{array}$$

Example #4: Are the data in the table linear? If so, write an equation in point-slope form.

A.

X	-1	3	5	11
y	4	6	7	10

$$y = \frac{8}{3}x - \frac{7}{3}$$

$$\frac{\Delta y}{\Delta x} = \frac{2}{4} = \frac{1}{2} \quad \frac{1}{2} \quad \frac{3}{6} = \frac{1}{2}$$

$x_2 - x_1$   
 $y_2 - y_1$

linear!  $y - 6 = \frac{1}{2}(x - 3)$

B.

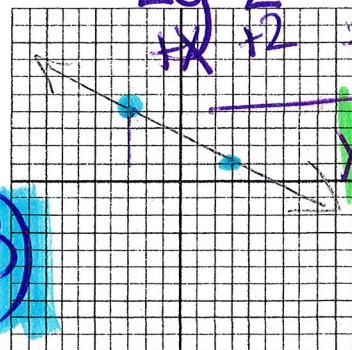
X	-2	-1	1	2
y	-2	-1	0	1

$$\begin{aligned} y - 1 &= -\frac{1}{2}(x - 3) \\ 2(y - 1) &= -\frac{1}{2}x + \frac{3}{2} \\ 2y - 2 &= -x + 3 \\ +x + 2 & \quad +x + 2 \\ \hline x + 2y &= 5 \end{aligned}$$

Example #5: Write an equation in point slope form:

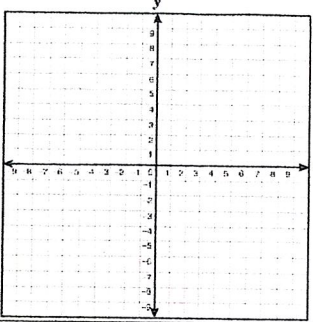
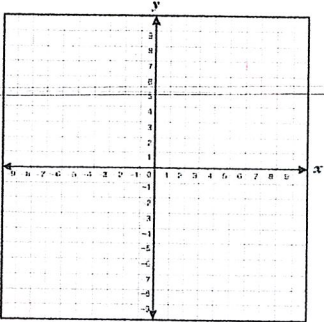
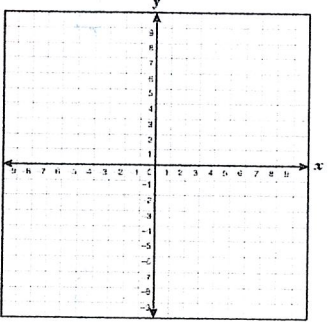
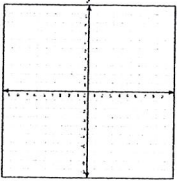
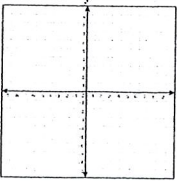
$$m = \frac{-3}{6} = -\frac{1}{2} \quad (3, 1)$$

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



pg 307  
# 3-45 mult 3  
65-69 all

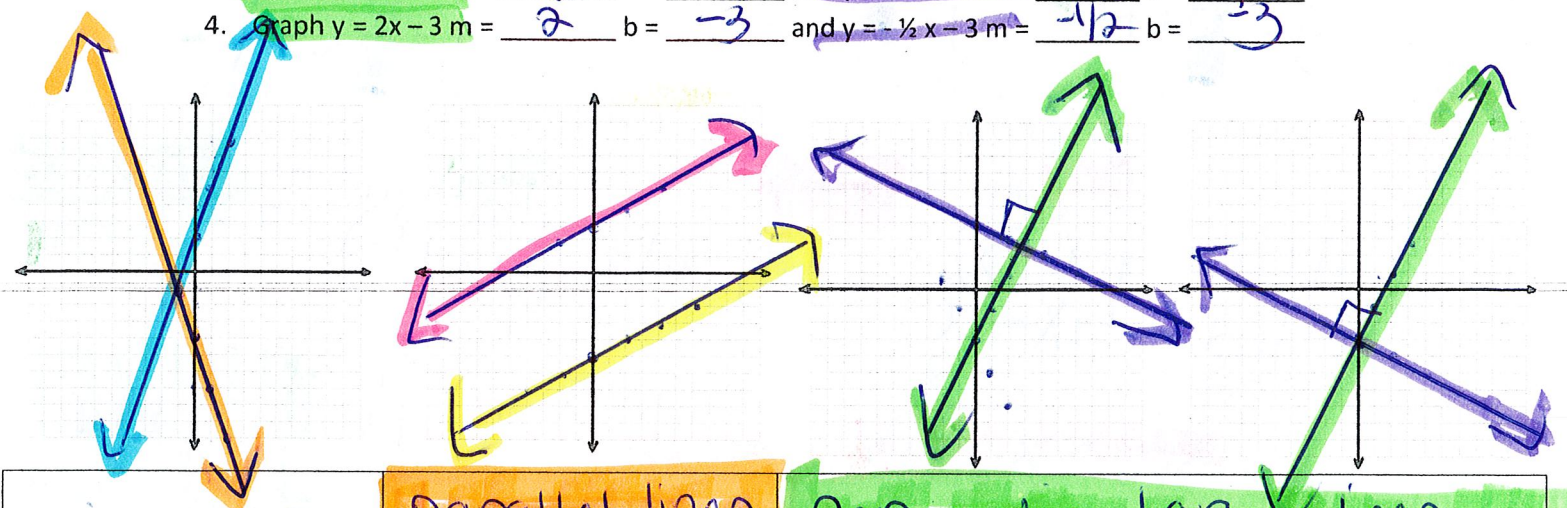
Summary:

	Example:	Graph:
Slope intercept form:		
Standard Form:		
Point-Slope Form		
Vertical Lines:		
Horizontal Lines:		

Parallel and Perpendicular Lines

Investigation:

- Graph  $y = 3x + 2$   $m = 3$   $b = 2$  and  $y = -3x - 4$   $m = -3$   $b = -4$
- Graph  $y = \frac{1}{2}x - 5$   $m = \frac{1}{2}$   $b = -5$  and  $y = \frac{1}{2}x + 3$   $m = \frac{1}{2}$   $b = 3$
- Graph  $y = 2x - 3$   $m = 2$   $b = -3$  and  $y = -\frac{1}{2}x + 4$   $m = -\frac{1}{2}$   $b = 4$
- Graph  $y = 2x - 3$   $m = 2$   $b = -3$  and  $y = -\frac{1}{2}x - 3$   $m = -\frac{1}{2}$   $b = -3$



intersecting.	parallel lines - same slope - different y-int	perpendicular lines - opposite signs AND reciprocals - y-int: Any
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same slope!

Like #1-6 Find the slope of the line parallel to the graph of the equation:

1.  $Y = x + 5$

$m = 1$

//  $m = 1$

2.  $Y = -3x - 4$

$m = -3$

//  $m = -3$

3.  $Y = 2$

$m = 0$

//  $m = 0$

4.  $X = 5$

$m = \phi$

//  $m = \phi$

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

$-3x \quad -3x$

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

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

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

//  $m = \frac{3}{5}$

6.  $4x + y = -8$

$-4x \quad -4x$

$$y = -4x - 8$$

$m = -4$

//  $m = -4$

solve for y.

Like #7-12 Are the graphs of the lines in each pair parallel?

6.  $Y = -\frac{4}{3}x + 10$

$12x + 9y = 54$

parallel - same slope  $(-\frac{4}{3})$  diff. y-int  $(10 \neq 6)$

$$\frac{9y}{9} = \frac{-12x + 54}{9}$$

$$y = -\frac{4}{3}x + 6$$

7.  $Y = 3x + 2$

$3x - y = -2$

not parallel - same slope  $(3)$  and y-int  $(2)$

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

$$y = 3x + 2$$

8.  $Y = \frac{1}{2}x + 6$

$4x - 8y = 32$

parallel - same slope  $(\frac{1}{2})$  different y-int  $(6 \neq -4)$

$$\frac{-8y}{-8} = \frac{-4x + 32}{-8}$$

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

Like #13-18 Write an equation for the line that is parallel to the given line and passes through the given equation: point:

9.  $y = 4x + 12$

$(5, -2)$

$m = 4$

$\parallel m = 4$

$$y + 2 = 4(x - 5)$$

$$y + 2 = 4x - 20$$

$$y = 4x - 22$$

10.  $Y = -\frac{3}{4}x + 1$

$(-8, 12)$

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

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

$$y - 12 = -\frac{3}{4}(x + 8)$$

$$y - 12 = -\frac{3}{4}x - 6$$

$$y = -\frac{3}{4}x + 6$$

Like #19-24 Find the slope of the line PERPENDICULAR to the graph of each equation:

11.  $y = -x + 4$

$m = -1$

$\perp m = 1$

12.  $Y = \frac{4}{5}x + 16$

$m = 4/5$

$\perp m = -5/4$

13.  $Y = 10$

$m = 0$

$\perp m = \emptyset$

14.  $x = 15$

$m = \emptyset$

$\perp m = 0$

15.  $3x + 6y = 12$

$\frac{6y}{6} = \frac{-3x + 12}{6}$

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

$m = -1/2$

$\perp m = 2$

16.  $Y = 5x - 6$

$m = 5$

$\perp m = -1/5$

Like #25-31 Write an equation for the line that is perpendicular to the given line and that passes through the point:

17.  $y = 4x + 2$

$(-4, 12)$

$m = 4$

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

$$y - 12 = -\frac{1}{4}(x + 4)$$

$$y = -\frac{1}{4}x + 11$$

18.  $6x - 8y = -24$

$(-1, 5)$

$m = 3/4$

$\perp m = -4/3$

$$y - 5 = -\frac{4}{3}(x + 1)$$

$$y - 5 = -\frac{4}{3}x - \frac{4}{3}$$

$$y = -\frac{4}{3}x + \frac{11}{3}$$

Are the lines parallel, perpendicular, or neither?

19.  $2x - 5y = 15, 2x + 5y = 10$

$\frac{-5y}{-5} = \frac{-2x + 15}{-5}$

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

$m = 2/5$

$\frac{5y}{5} = \frac{-2x + 10}{5}$

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

$m = -2/5$

Neither