

## What's Going On?

**Checking In**

**Minds on**      Linear or Non-Linear?

**Action!**      Unit Review

**Consolidation**      Culminate!

**Learning Goal - I will be able to problem solve with linear relations.**

## Minds on

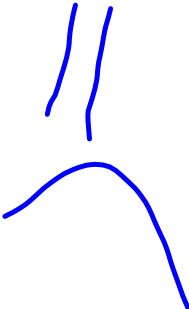
Linear or Non-Linear?

$y = 5x - 3$	$y = 2x^3$
$y = 5x^2 - 3$	$2x^2 + 5y^2 = 10$
$y = -3x$	$y = 125 - 4.3x$
$x = 4$	$x = -6$
$y = 2x + 4^3$	

**Minds on**

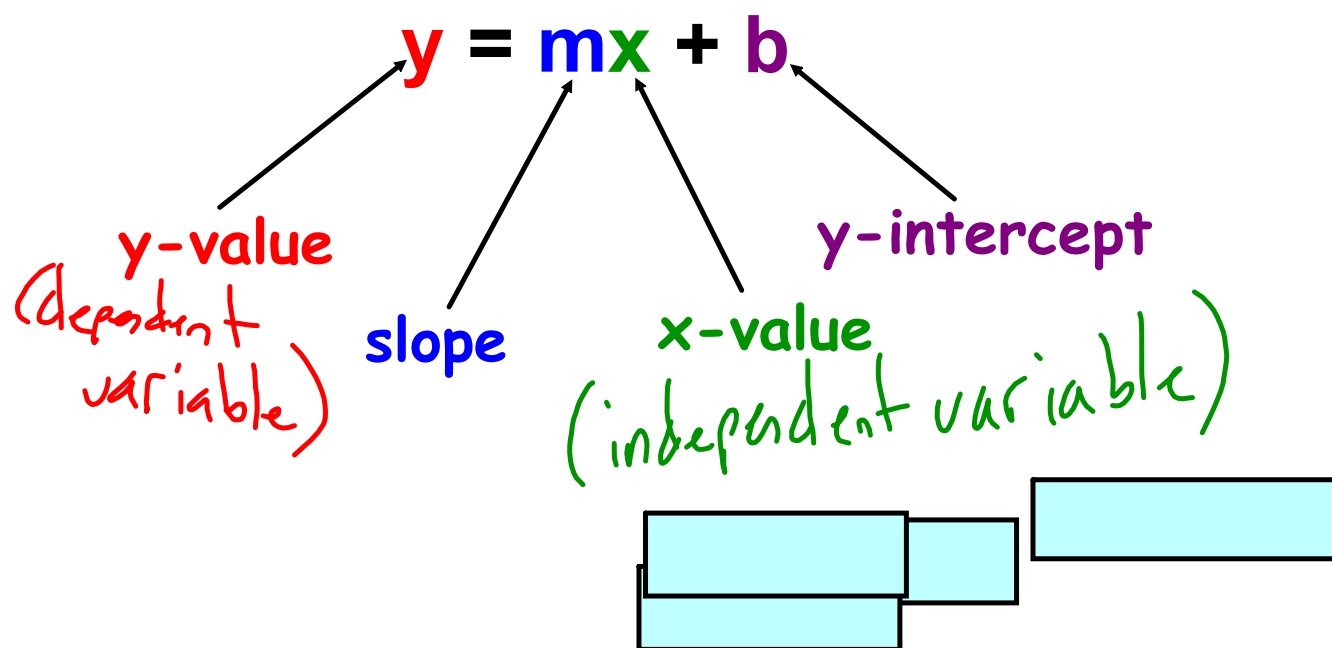
Linear or Non-Linear?

$$xy = 10$$


$$y = 2^x$$


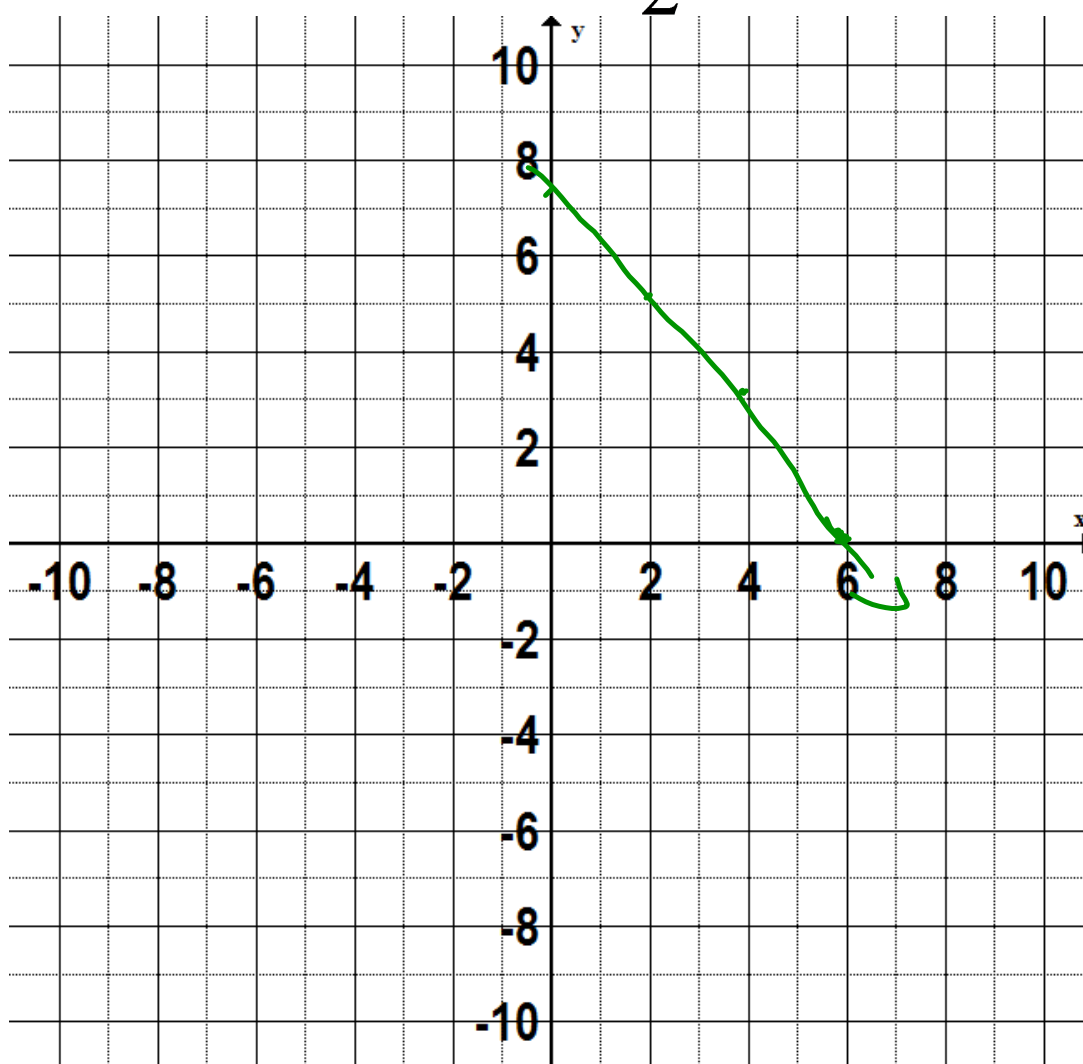
## Minds on

### Analyse Linear Relations - Recap

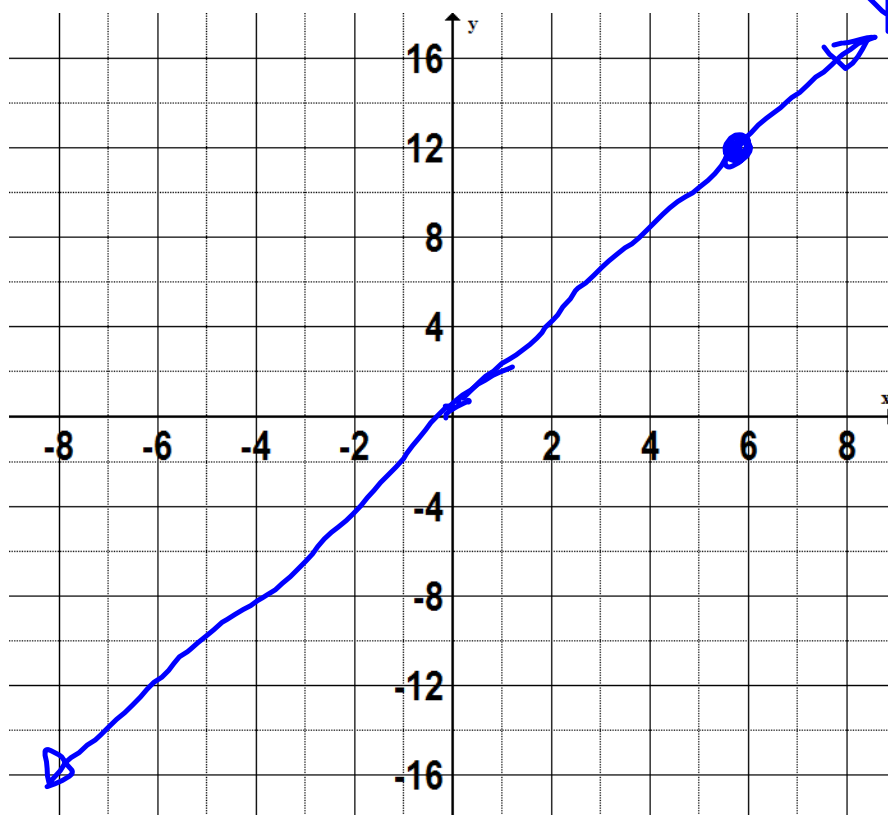


# Graphing

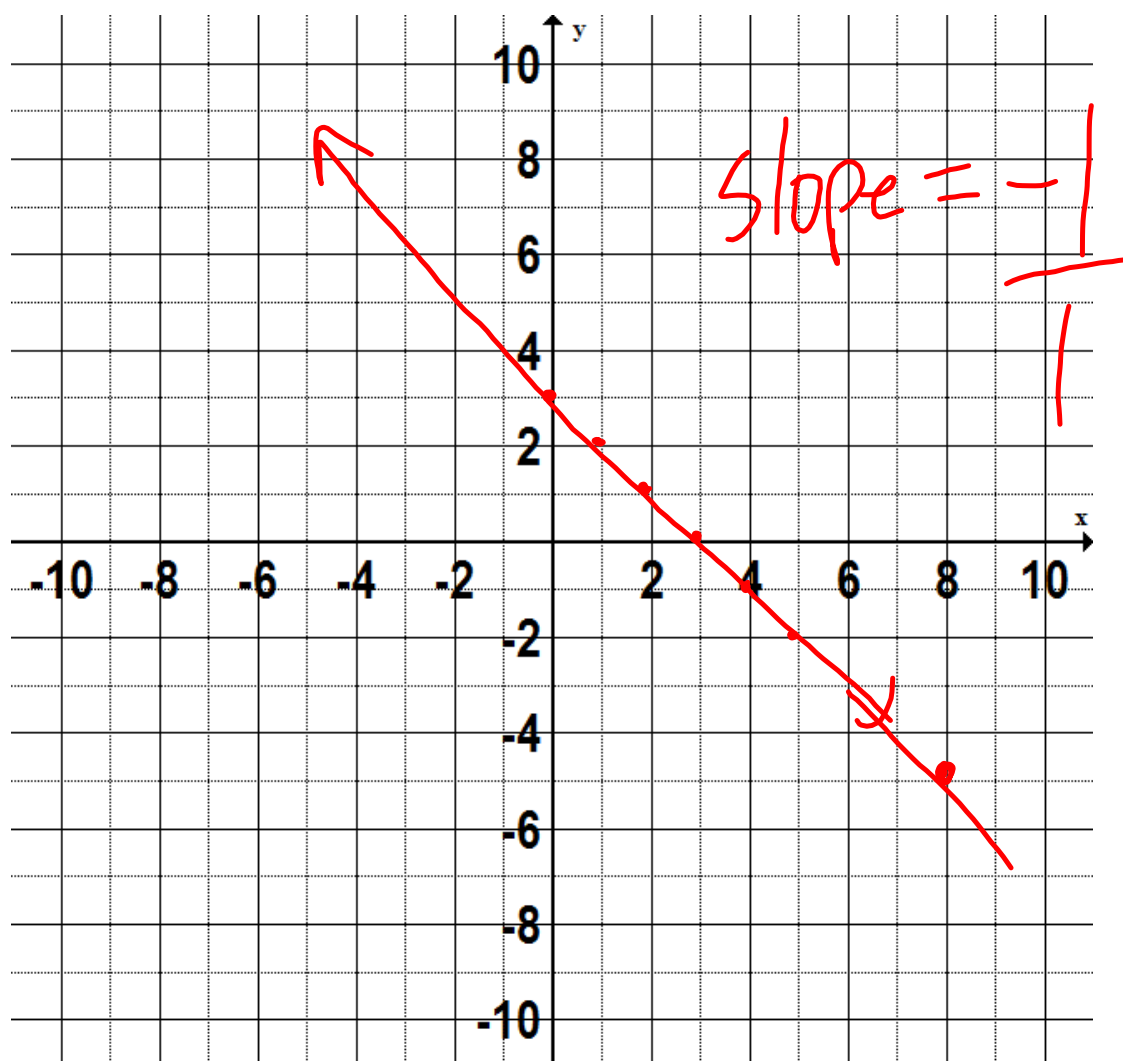
Graph the line given below:  $y = -\frac{3}{2}x + 7$



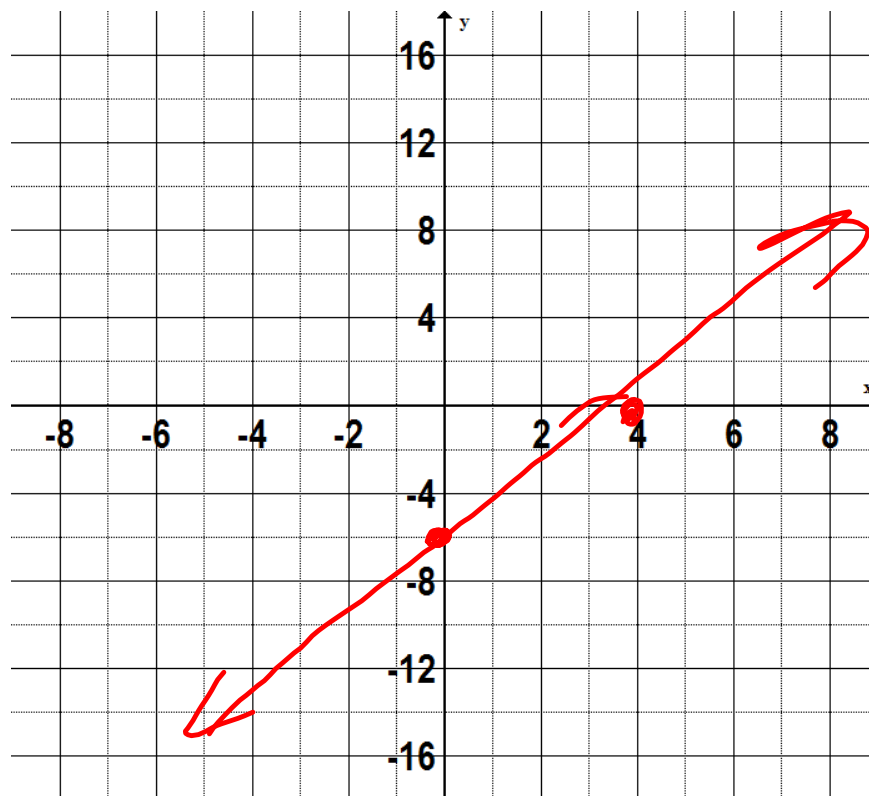
Graph the line given below:  $y = 2x$



Graph the line given below:  $y = -x + 3$



Graph the line given below:  $3x - 2y = 12$



Rearrange

$$\begin{array}{r}
 3x - 2y = 12 \\
 \underline{-3x} \qquad \underline{-3x} \\
 -2y = -3x + 12 \\
 \underline{-2} \qquad \underline{-2} \qquad \underline{-2} \\
 y = \frac{3}{2}x - 6
 \end{array}$$

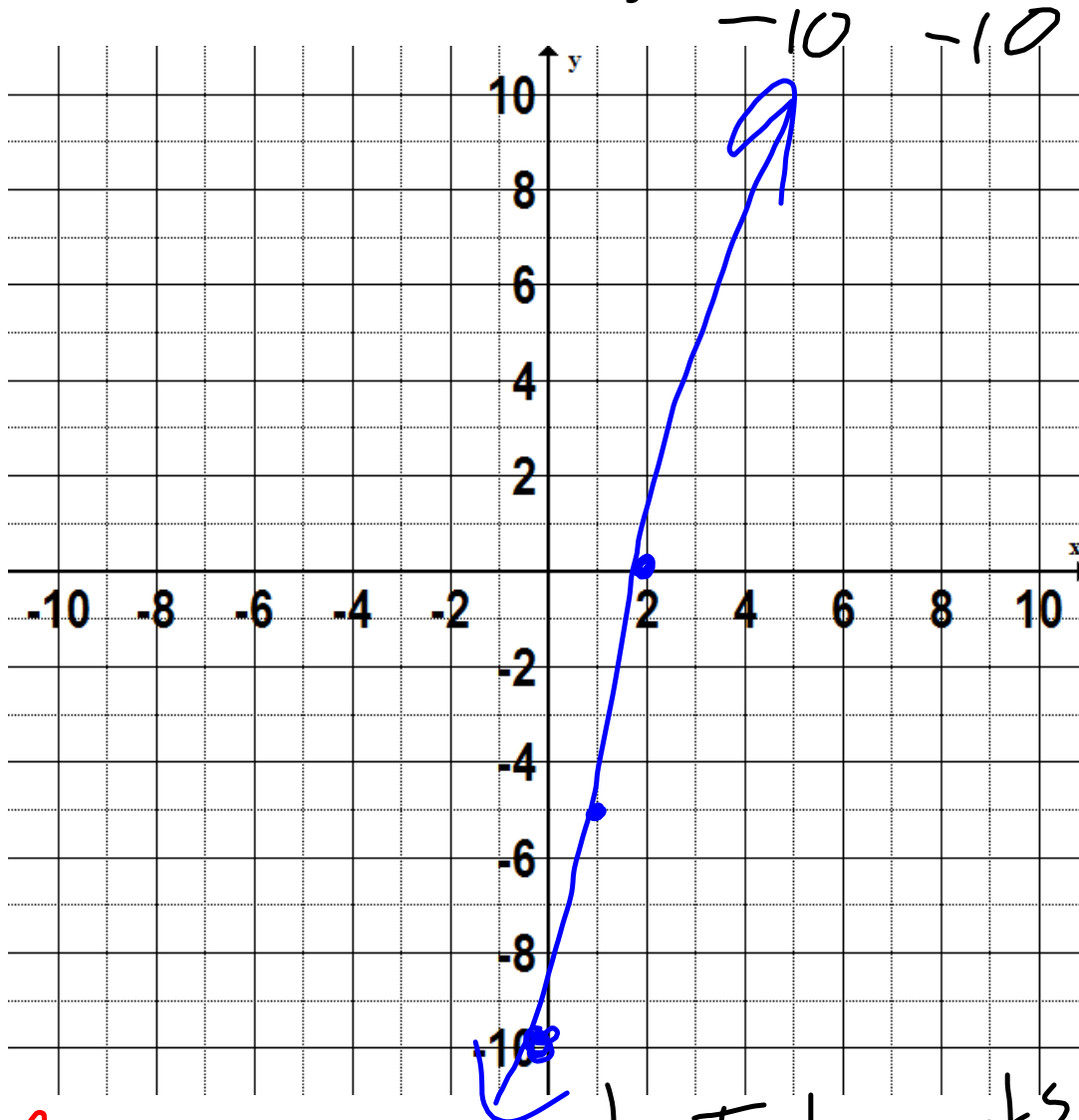
$$y = \frac{3}{2}x - 6$$

$$\begin{array}{l}
 \text{x-int} \\
 \hline
 3x = 12 \\
 x = 4
 \end{array}$$

$$\begin{array}{l}
 \text{y-int} \\
 \hline
 -2y = 12 \\
 y = -6
 \end{array}$$



Graph the line given below:  $-5x + y + 10 = 0$



Rearrange

$$\begin{array}{r}
 -5x + y + 10 = 0 \\
 +5x \quad -10 \quad +5x - 10 \\
 \hline
 y = 5x - 10
 \end{array}$$

Intercepts  
 $-5x + y = -10$

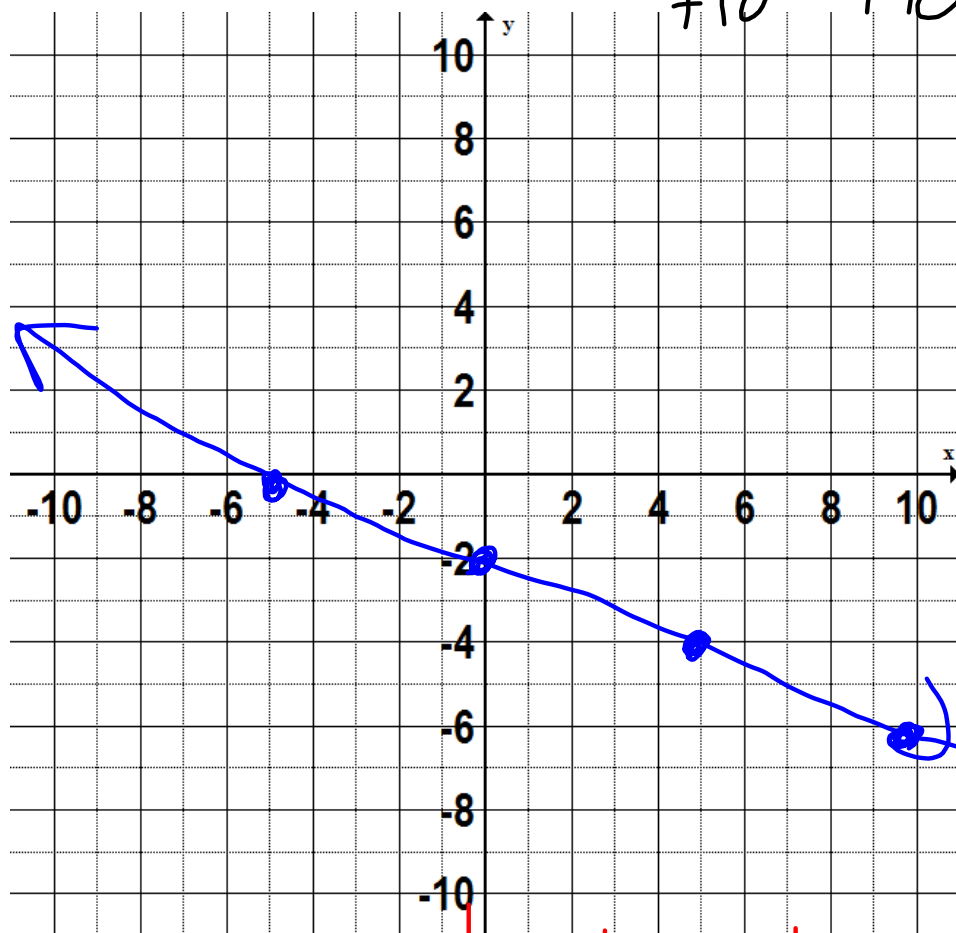
x-int

$$\begin{array}{r}
 -5x = -10 \\
 \frac{-5x}{-5} = \frac{-10}{-5} \\
 x = 2
 \end{array}$$

y-int

$$y = -10$$

Graph the line given below:  $-2x - 5y - 10 = 0$   
 $\quad\quad\quad +10 \quad +10$



Rearrange

$$-2x - 5y - 10 = 0$$

$+10 \quad +10$

$$-2x - 5y = 10$$

$$-5y = 2x + 10$$

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

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

Intercepts

$$-2x - 5y = 10$$

<u>x-int</u>	<u>y-int</u>
$-2x = 10$	$-5y = 10$
$x = -5$	$y = -2$

**Example:** Find the equation of the line through the points  $(-1, 7)$  and  $(-5, -9)$ .

$x_1$   $y_1$        $x_2$   $y_2$

① Find slope       $m = \frac{y_2 - y_1}{x_2 - x_1}$

② Find y-int

Rearrange  $y = mx + b$

or

Use  $b = y - mx$

$$m = \frac{-9 - 7}{-5 - (-1)}$$

$$m = \frac{-16}{-4}$$

$$m = 4$$

$m = 4$

using point 2

$x = -5$

$y = -9$

$$y = mx + b$$

$$(-9) = (4)(-5) + b$$

$$-9 = -20 + b$$

$+20$

$$b = 11$$

$$\therefore y = 4x + 11$$

## Parallel and Perpendicular Lines

Give the equation of a line parallel, and a line perpendicular to:

	$y = \frac{3}{1}x - 8$	$y = \frac{-2}{1}x + 2$	$y = -\frac{3}{2}x + 7$
Parallel	$y = 3x - 7$	$y = -2x + 3$	$y = -\frac{3}{2}x + 2$
Perpendicular	$y = -\frac{1}{3}x + 7$	$y = \frac{1}{2}x - 4$	$y = \frac{2}{3}x + 6$

	$y = 9$	$y = -x + 6$	$x = -2$
Parallel	$y = 7$	$y = -x + 7$	$x = -4$
Perpendicular	$x = 7$	$y = x + 6$	$y = 4$

**Example:** Find the equation of the line perpendicular to  $3x - 7y = 35$  and sharing the same y-intercept.

① Find slope of  $3x - 7y = 35$

$$\begin{aligned} -7y &= -3x + 35 \\ \frac{-7y}{-7} &= \frac{-3x}{-7} + \frac{35}{-7} \\ y &= \frac{3}{7}x - 5 \end{aligned}$$

Slope  $\rightarrow \frac{3}{7}$       y-int  $\rightarrow -5$   
 Our slope  $\rightarrow -\frac{7}{3}$       our y-int  $\rightarrow -5$  ∩

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

**Example:** Find the equation of the line with the same slope as  $2x + 8y - 15 = 0$  through the point (3, 2).

1. Find the slope of  $2x + 8y - 15 = 0$  by rearranging the equation.

$$\begin{array}{l}
 2x + 8y - 15 = 0 \\
 -2x \quad +15 \quad -2x + 15 \\
 \hline
 8y = -2x + 15 \\
 \frac{8y}{8} = \frac{-2x + 15}{8} \\
 y = \frac{-2}{8}x + \frac{15}{8} \\
 \text{* Slope} = -\frac{2}{8} \\
 \text{OR } -\frac{1}{4}
 \end{array}$$

2. Use the slope you just found and the point (3, 2) to find the y-intercept!

$$\begin{array}{l}
 x \quad y \\
 b = y - mx \\
 m = -\frac{1}{4} \\
 x = 3 \\
 y = 2
 \end{array}$$

$$b = (2) - \left(-\frac{1}{4}\right)(3)$$

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

$$b = 2 + \frac{3}{4}$$

$$b = \frac{8}{4} + \frac{3}{4}$$

$$b = \frac{11}{4}$$

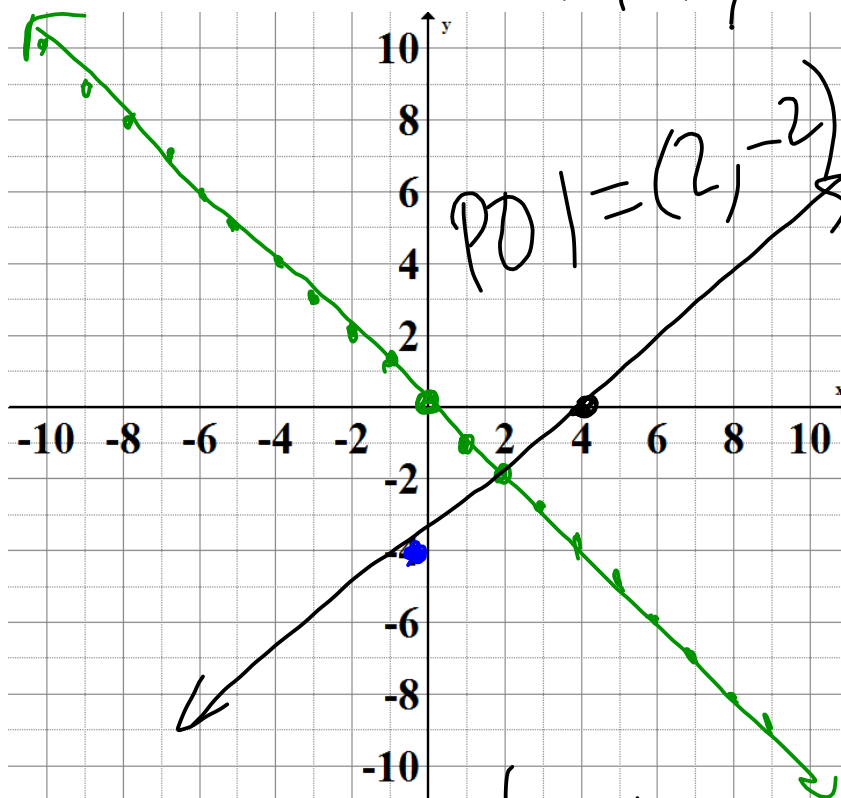
$$y = -\frac{1}{4}x + \frac{11}{4}$$

$$y = -\frac{1}{4}x + 2.75$$

# Linear Systems

Solve the system of linear equations below by graphing.

$y = -x$  and  $x - y - 4 = 0$   
 $+4 \quad +4$



Rearrange

~~$x - y - 4 = 0$~~   
 $+4 \quad +4$   
 $x - y = 4$   
 $-y = x + 4$   
 $-1 = -1$   
 $y = -x - 4$

Intercepts  
 $x - y = 4$

$\frac{x\text{-int}}{x=4} \quad \frac{y\text{-int}}{y=-4}$

You are on a road trip. After 30 minutes on the road, you are 250 km from home. After 2 hours on the road, you are 115 km from home. At what speed are you travelling?

From 30 minutes to 2 hours is an hour and a half or **1.5 hours!**

You were at 250 km from home, you are now at 115 km from home... You travelled

( $250 - 115 = \mathbf{135 \text{ km}}$ )

Speed = Distance divided by Time

$$= 135 \text{ km} / 1.5 \text{ h}$$

$$= \underline{\mathbf{90 \text{ km/h}}}$$