

# Homework 3 Solutions

①  $(3, -2)$      $(-6, -8)$   
     $\uparrow$      $\uparrow$              $\uparrow$      $\uparrow$   
     $x_1$     $y_1$              $x_2$     $y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - (-2)}{-6 - 3} = \frac{-8 + 2}{-9} = \frac{-6}{-9} = \frac{2}{3}$$

Use point-slope formula:

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

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

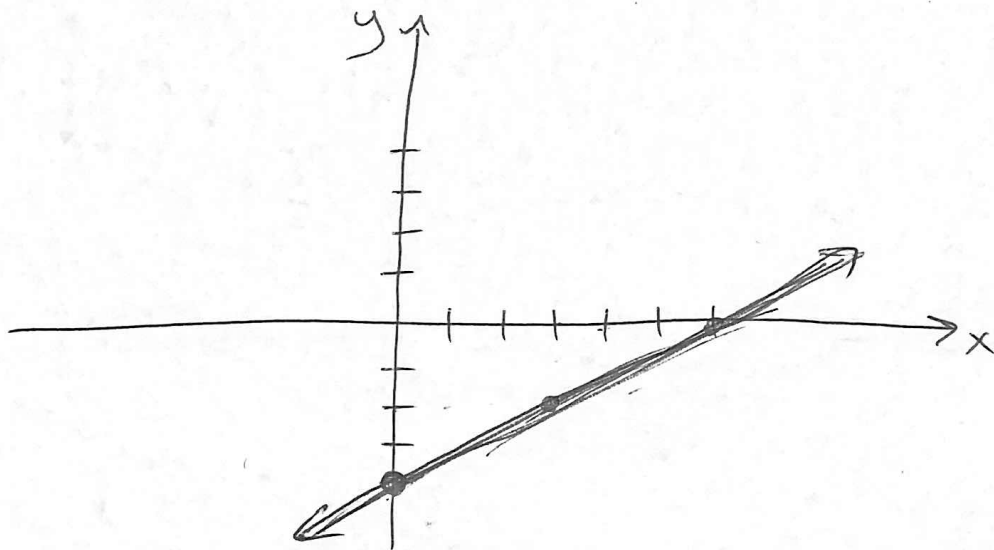
$$y + 2 = \frac{2}{3}x - \frac{2}{3}(3)$$

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

$\Rightarrow$

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

Slope  $m = \frac{2}{3}$ , y-intercept is  $-4$



②  $(-6, 10)$  and  $(9, -10)$

$$m = \frac{-10 - 10}{9 - (-6)} = \frac{-20}{15} = -\frac{4}{3}$$

~~Point-slope formula:~~ Point-slope formula:

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

$$y - 10 = -\frac{4}{3}(x - (-6))$$

$$y - 10 = -\frac{4}{3}(x + 6)$$

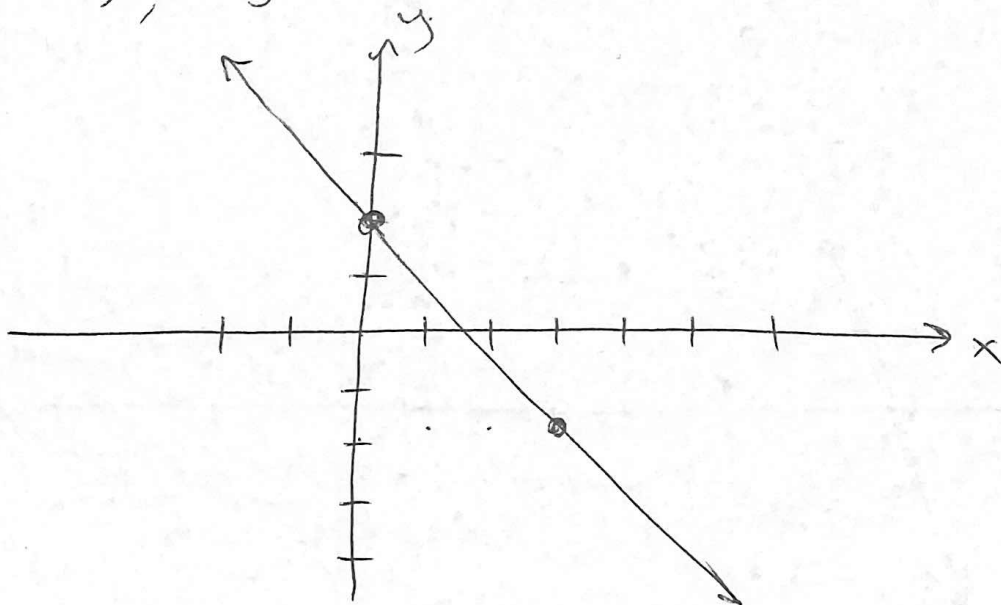
$$y - 10 = -\frac{4}{3}x - \frac{4}{3}(6)$$

$$y - 10 = -\frac{4}{3}x - 8$$

~~+10~~                      +10

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

slope  $-\frac{4}{3}$ , y-intercept 2



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

Point-slope formula:

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

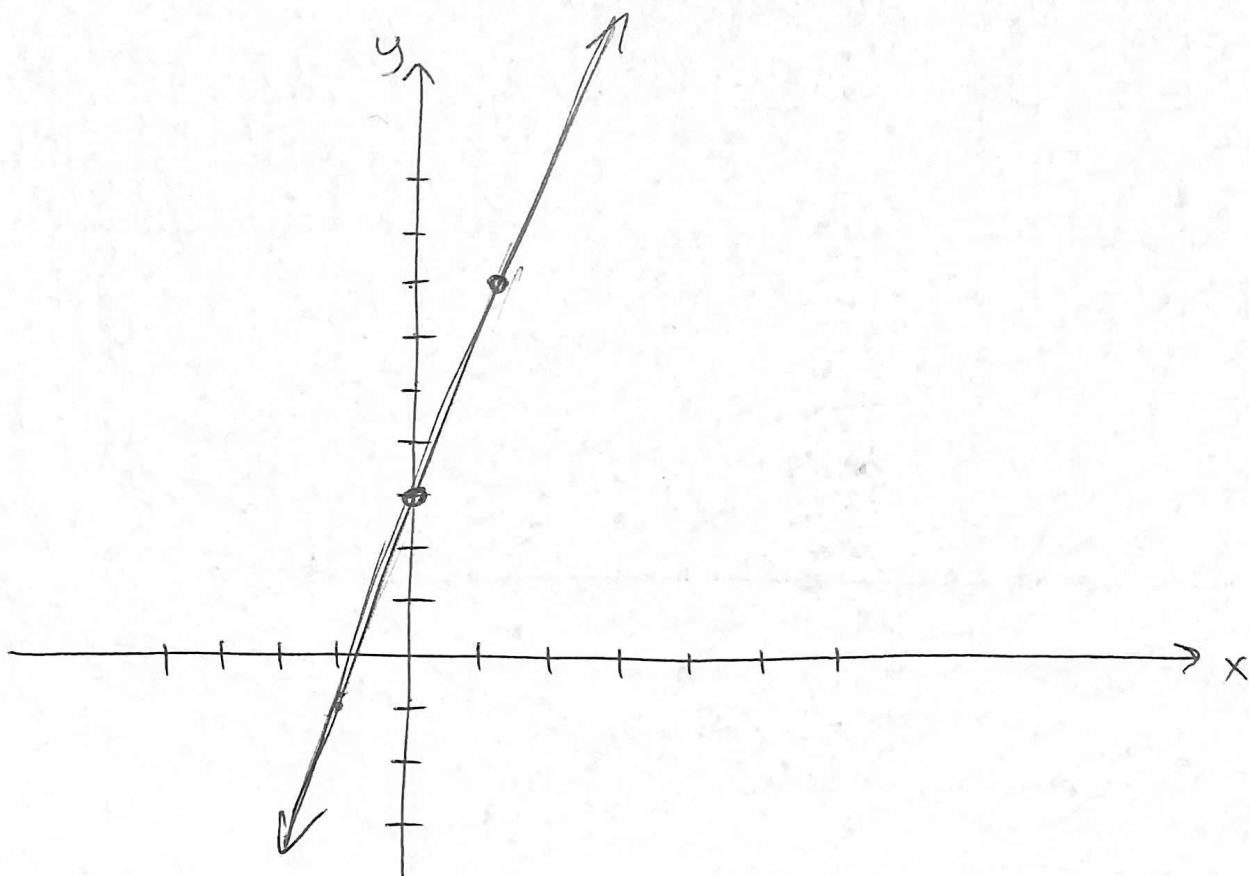
$$y - (-5) = 4(x - (-2))$$

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

$$\begin{array}{r} y + 5 = 4x + 8 \\ \underline{-5} \qquad \qquad \underline{-5} \end{array}$$

$$y = 4x + 3$$

Slope  $\frac{4}{1}$ , y-intercept 3



$$\textcircled{4} \quad 16x - 4y = 36$$

Solve for  $y$ !

$$\cancel{16x} - 4y = 36$$

$$\cancel{-16x} \qquad -16x$$

$$-4y = -16x + 36$$

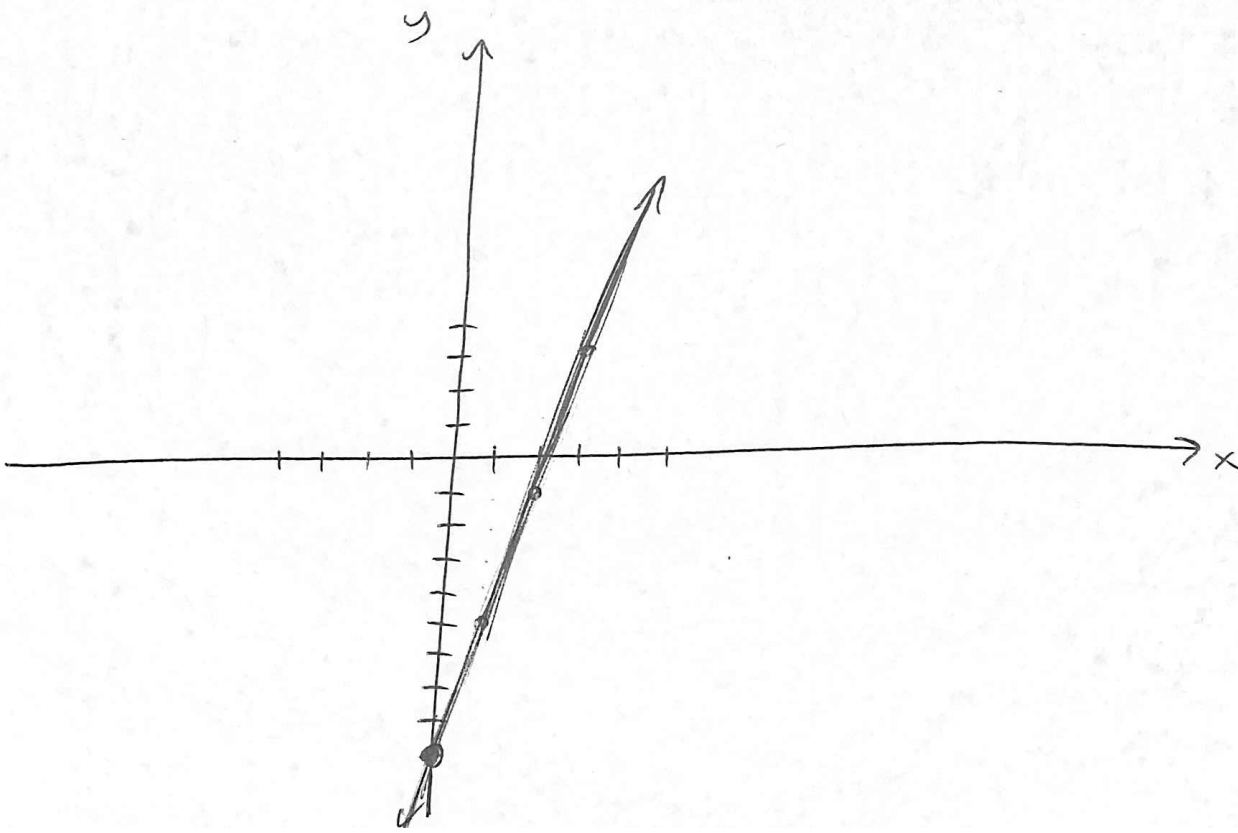
Divide both by  $-4$ :

$$\frac{\cancel{-4y}}{\cancel{-4}} = \frac{-16x}{-4} + \frac{36}{-4}$$

$$y = 4x - \frac{36}{4}$$

$$y = 4x - 9$$

↙ make sure  
to divide  
everything on  
the right  
by  $-4$ !



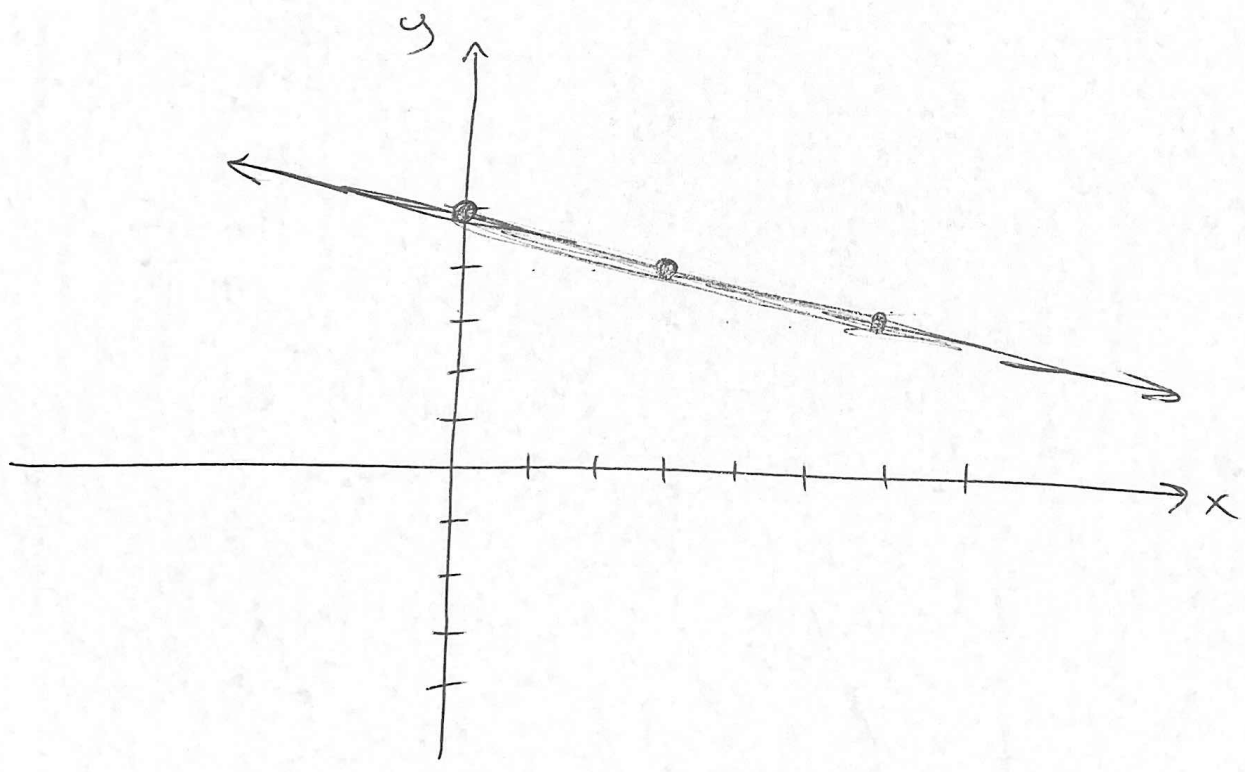
$$\textcircled{5} \quad 8x + 24y = 96$$

$$\begin{array}{r} -8x \\ \hline \end{array} \quad \begin{array}{r} -8x \\ \hline \end{array}$$

$$\frac{24y}{24} = \frac{-8x + 96}{24}$$

$$y = -\frac{8x}{24} + \frac{96}{24}$$

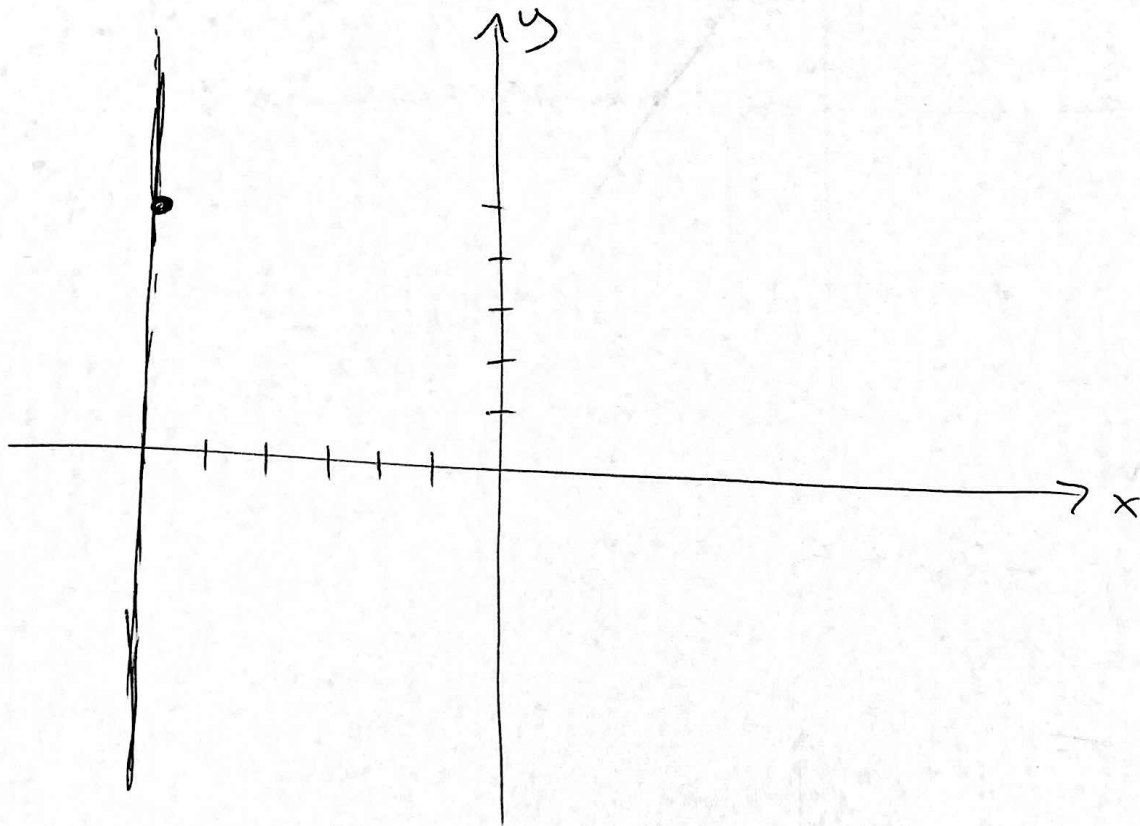
$$y = -\frac{1}{3}x + 4$$



(6) ~~m~~  $m = \text{undefined}$ ,  $(-6, 5)$

If a line has undefined slope,  
that means it is a vertical line!

So plot the point  $(-6, 5)$ , and draw  
the vertical line through it.

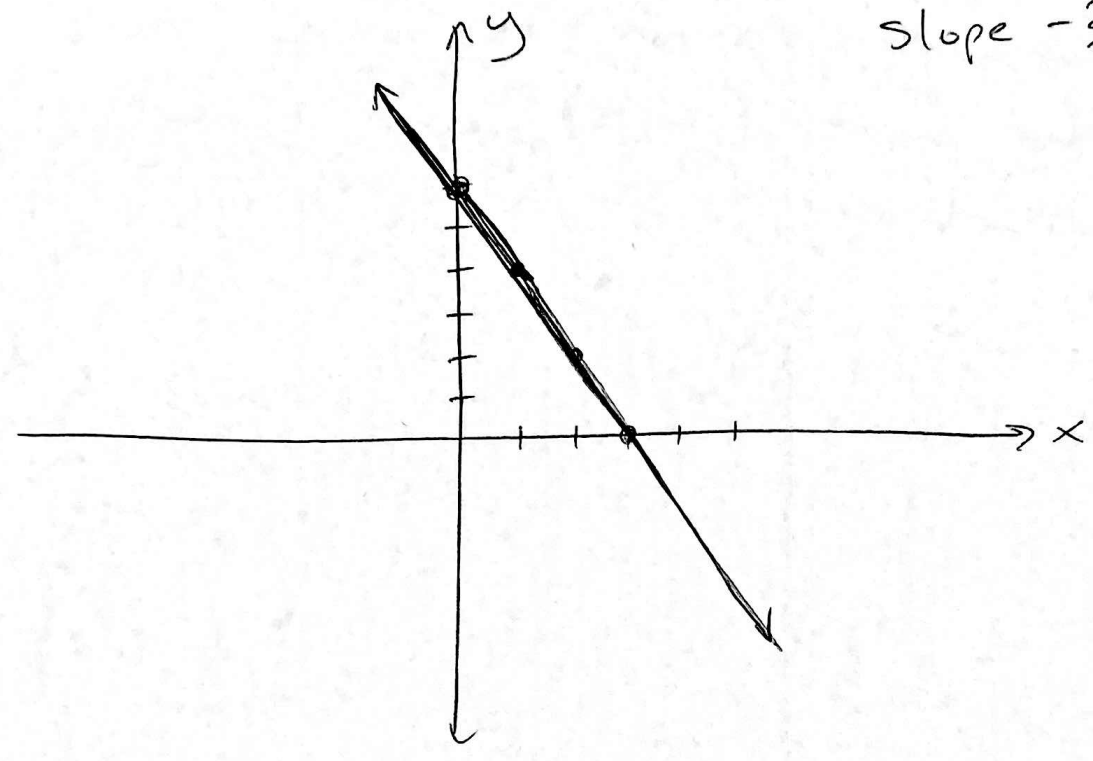


The equation of the line is  $x = -6$ .

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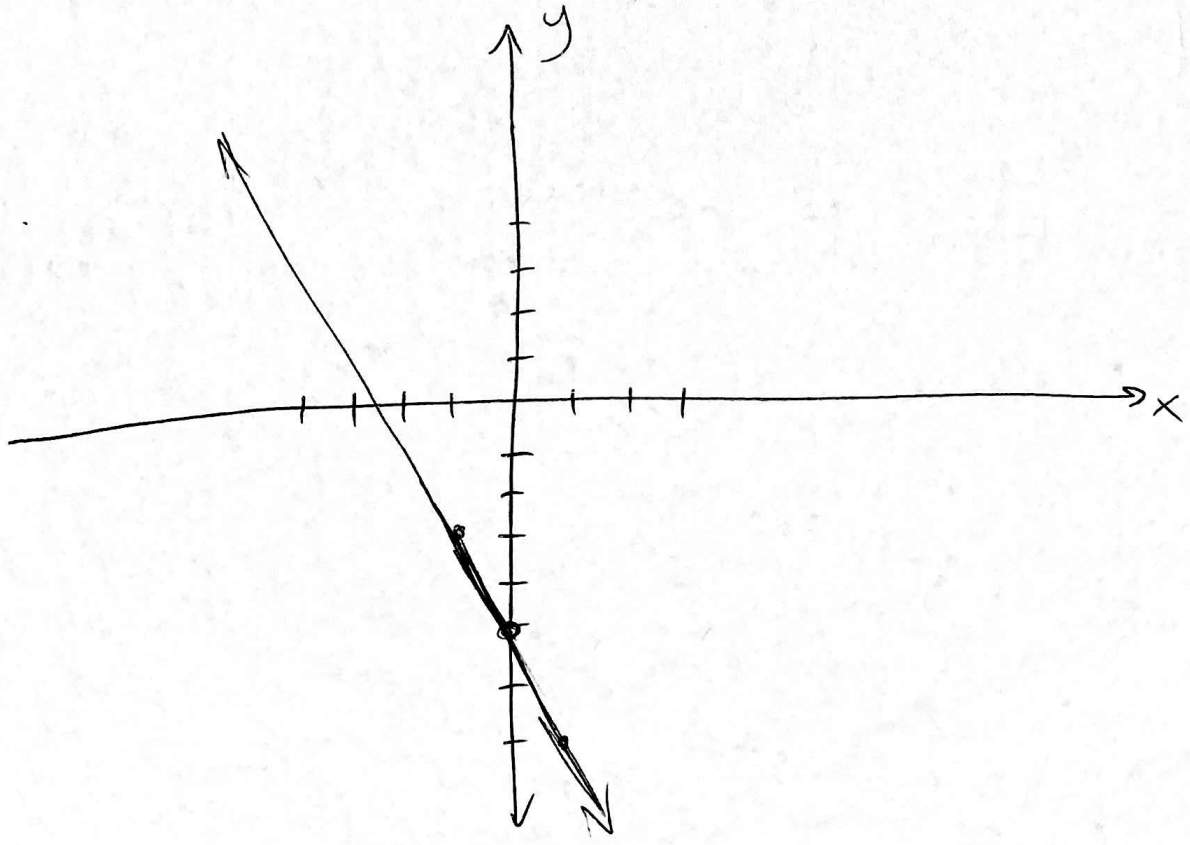
$$y = -2x + 6$$

y-intercept 6,  
slope  $-\frac{2}{1}$



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$$y = -2x - 5$$



⑨  $(-5, 13)$  and  $(3, -3)$   
 $\begin{matrix} \nearrow & \nearrow \\ x_1 & y_1 \end{matrix}$        $\begin{matrix} \nearrow & \nearrow \\ x_2 & y_2 \end{matrix}$

$$m = \frac{-3 - 13}{3 - (-5)} = \frac{-16}{3 + 5} = \frac{-16}{8} = -2$$

Now point - slope formula:

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

$$y - (13) = -2(x - (-5))$$

$$y - 13 = -2(x + 5)$$

$$y - 13 = \cancel{0} - 2x - 10$$

$\begin{matrix} +13 & & +13 \end{matrix}$

$$y = -2x + 3$$



10 Equation of the line parallel to  $y = 3x - 2$ , passing through  $(-2, 1)$ .

We want a line parallel to the given one, so it must also have slope  $m = 3$ .

Point-slope formula:  $y - y_1 = m(x - x_1)$

$$y - 1 = 3(x - (-2))$$

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

$$y - 1 = 3x + 6$$

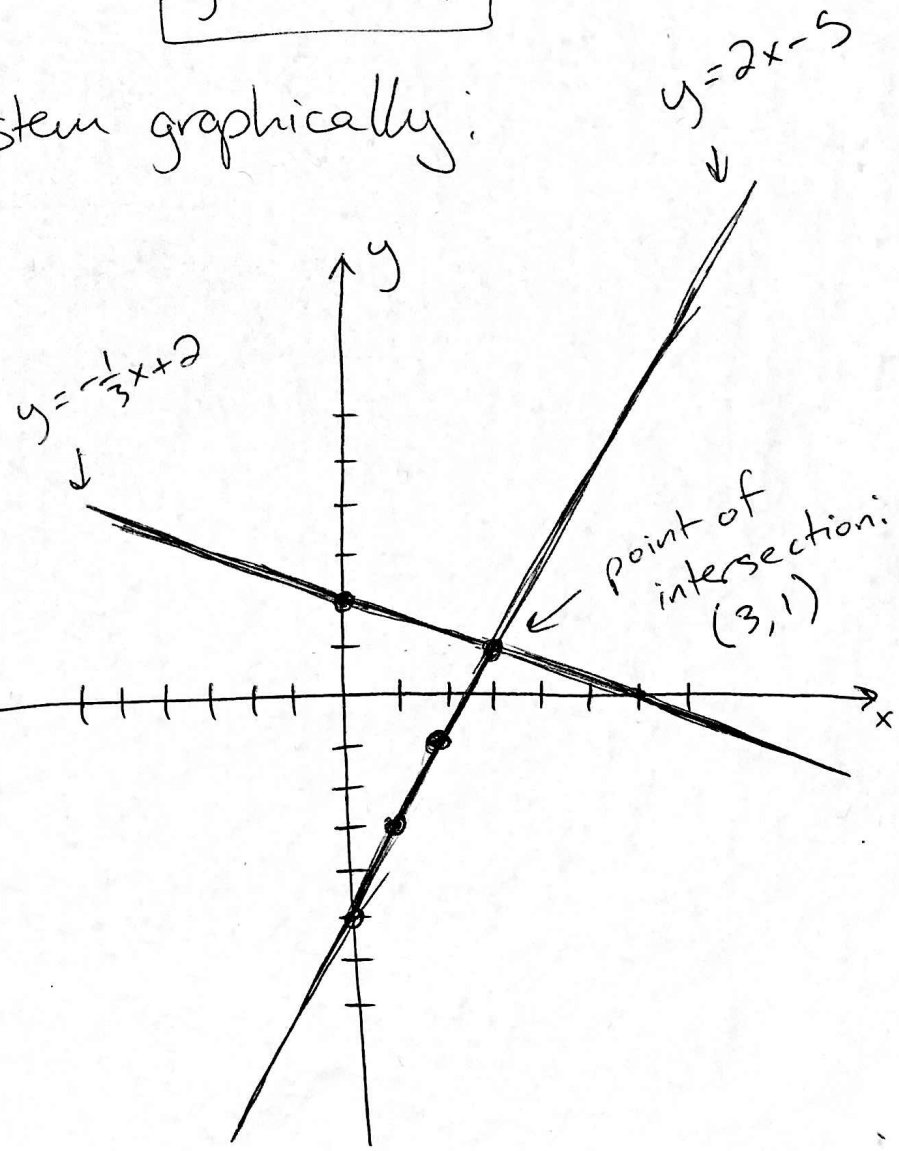
$$\boxed{y = 3x + 7}$$

11 ~~Solve~~ Solve the system graphically:

$$y = 2x - 5$$

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

The solution is  $(3, 1)$ .



12) Solve graphically and by elimination.

$$\begin{cases} 12x - 8y = 48 \\ y - 4 = -2(x - 2) \end{cases}$$

First, get all in slope-intercept form in order to graph. So, solve for y.

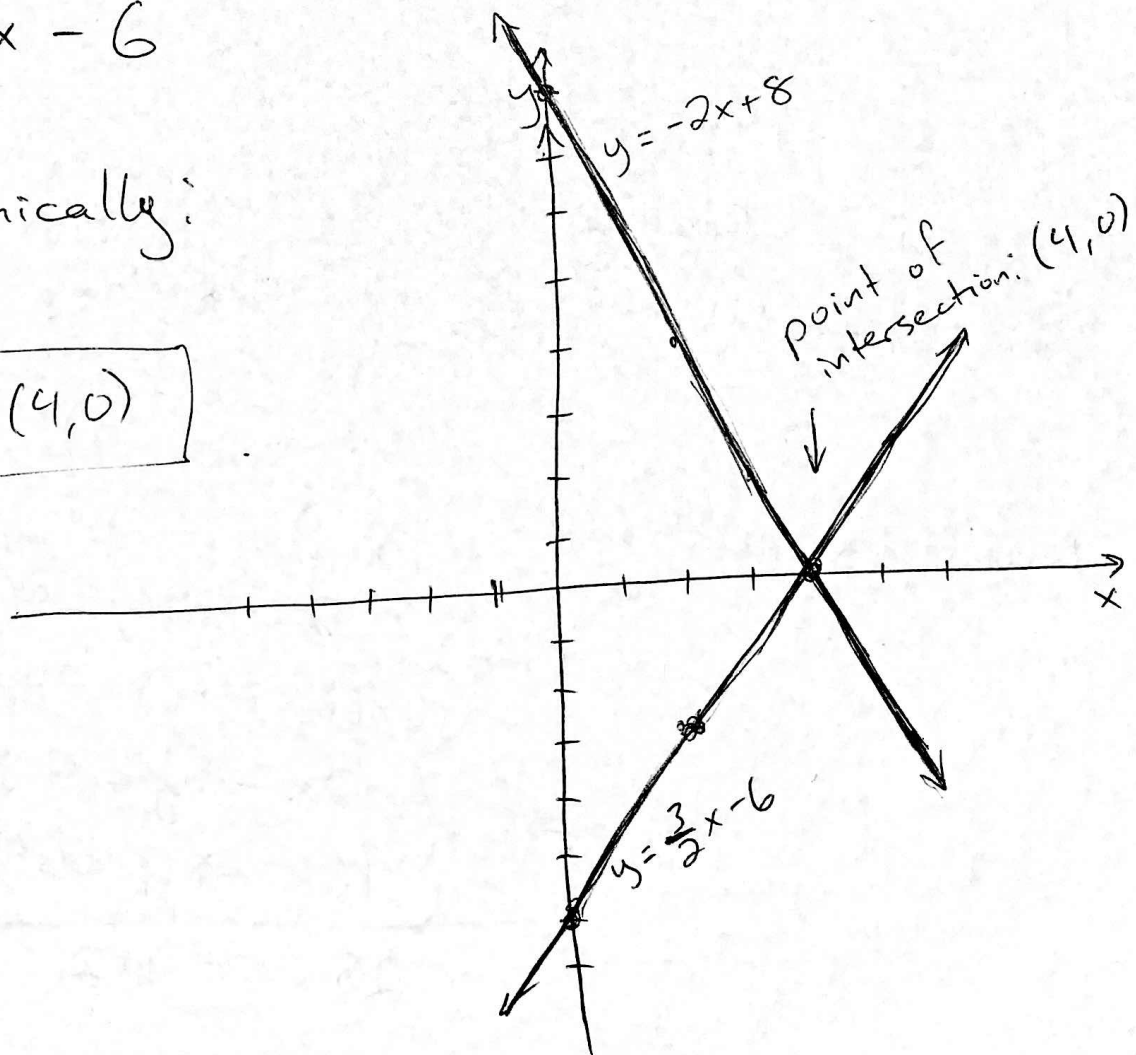
$$\begin{array}{r} 12x - 8y = 48 \\ -12x \quad -12x \\ \hline -8y = -12x + 48 \\ \hline \frac{-8y}{-8} = \frac{-12x}{-8} + \frac{48}{-8} \\ y = \frac{3}{2}x - 6 \end{array}$$

and

$$\begin{array}{r} y - 4 = -2(x - 2) \\ y - 4 = -2x + 4 \\ \quad +4 \quad \quad +4 \\ \hline y = -2x + 8 \end{array}$$

Solve graphically:

Solution is (4, 0)



12 continued: now, solve by elimination.

$$\begin{cases} 12x - 8y = 48 \\ y - 4 = -2(x - 2) \end{cases}$$

Manipulate equation 2 to look like equation 1:

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

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

$+2x \quad +2x$

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

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

$+4 \quad +4$

$$y + 2x = 8$$

$$2x + y = 8$$

So the system is

$$\begin{cases} 12x - 8y = 48 \\ 2x + y = 8 \end{cases}$$

Multiply equation 2 by 8.

$$\begin{cases} 12x - 8y = 48 \\ 8(2x + y) = 8(8) \end{cases}$$

$$\rightarrow \begin{cases} 12x - 8y = 48 \\ + \quad 16x + 8y = 64 \end{cases}$$

now add:

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$$28x = 112 \quad \leftarrow \text{solve for } x!$$

(12) continued:  $\frac{28x}{28} = \frac{112}{28}$

$$x = 4$$

So  $x = 4$ . What is  $y$ ? Go back to equation 1 (or 2):

$$12x - 8y = 48, \text{ plug in } x = 4$$

$$12(4) - 8y = 48$$

$$\begin{array}{r} 48 \\ -48 \\ \hline \end{array} - 8y = \begin{array}{r} 48 \\ -48 \\ \hline \end{array}$$

$$\begin{array}{r} -8y = 0 \\ \hline -8 \end{array}$$

$$y = 0$$

So the solution is  $(4, 0)$ , as we saw when we graphed it.

13 Solve  $\begin{cases} 12x - 6y = -6 \\ 16x - 8y = 40 \end{cases}$

I will use substitution and solve the first equation for y.

$$\begin{array}{r} 12x - 6y = -6 \\ -12x \phantom{-6y} = -12x \\ \hline -6y = -12x - 6 \\ \phantom{-6y} = \phantom{-12x} \phantom{-6} \end{array}$$

Now in the second equation, replace y with  $y = 2x + 1$ .

$$\begin{array}{r} 16x - 8y = 40 \\ 16x - 8(2x + 1) = 40 \\ \phantom{16x} - 16x - 8 = 40 \\ \phantom{16x} - 16x - 8 = 40 \\ \phantom{16x} - 8 = 40 \end{array}$$

This is like material in the first week:  
there is no solution!

If you graphed these lines, they would never intersect (they are parallel).

(14) Tickets for the Valentine Dance cost \$3 per person and \$5 per couple. If \$475 worth of tickets were sold and 180 people attended the dance, how many couples were there?

Let  $x$  = the number of single attendees, and  
let  $y$  = the number of couples attending.

$$\text{Then } \begin{cases} 3x + 5y = 475 & \text{and} \\ x + 2y = 180. \end{cases}$$

Solve by elimination: multiply equation 2 on both sides by  $-3$ .

$$-3(x + 2y) = 180(-3)$$

$$-3x - 6y = -540$$

So the system is

$$\begin{cases} 3x + 5y = 475 \\ -3x - 6y = -540 \end{cases}$$

← Now add them!

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$$0x - y = -65$$

The resulting equation is  $\frac{-y}{-1} = \frac{-65}{-1}$

$$y = 65.$$

So  $y = \# \text{ of couples attending} = 65$