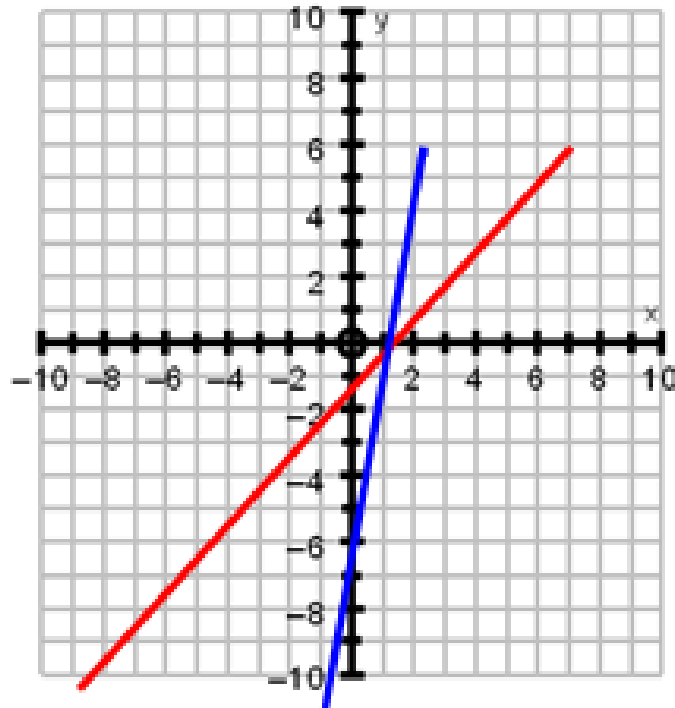


Solving Systems of Equations – Substitution Method

Solve the following system by graphing:

$$y = x - 1$$

$$y = 6x - 6$$



$$P.O.I (1, 0)$$

Once you know one variable go back to one of the original equations and fill it in to solve for the other variable

Graphing is not always a practical method when solving systems of equations. Note that both equations are rearranged for the y - variable. Set the two equations equal to each other and solve for x . What happens? Why does this work? How will you find the value of y ?

$$y = \underline{x - 1}$$

$$y = 6x - 6$$

$$\downarrow$$
$$x - 1$$

$$x - 1 = 6x - 6$$
$$-x \quad -x$$

$$+6 \quad -1 = 5x - 6 + 6$$

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

$$x = 1$$

$$y = x - 1$$
$$y = 1 - 1$$
$$y = 0$$

$$(1, 0)$$

$$(a) \begin{cases} y = 8x + 17 \\ y = -2x - 13 \end{cases}$$

$$8x + 17$$

$$8x + 17 = -2x - 13$$

$$8x + 17 + 2x = -13$$

$$10x + 17 = -13$$

$$10x = -17 - 13$$

$$\frac{10x}{10} = \frac{-30}{10}$$

$$x = -3$$

$$y = 8x + 17$$

$$y = 8(-3) + 17$$

$$y = -24 + 17$$

$$y = -7$$

$$(-3, -7)$$

$$(f) \begin{cases} y = 4x - 18 \\ -6x + 3y = -18 \end{cases}$$

$$4x - 18$$

$$-6x + 3(4x - 18) = -18$$

$$-6x + 12x - 54 = -18$$

$$6x - 54 = -18$$

$$6x = 54 - 18$$

$$\frac{6x}{6} = \frac{36}{6}$$

$$x = 6$$

$$y = 4x - 18$$

$$y = 4(6) - 18$$

$$y = 24 - 18$$

$$y = 6$$

$$(6, 6)$$

$$(g) \quad -8x + 6y = -14$$

(Red arrow points from 6y to -8x-21)

$$y = -8x - 21$$

(Red underline under the equation)

(Blue double-headed arrow above the equation)

$$-8x + 6(-8x - 21) = -14$$

$$-8x - 48x - 126 = -14$$

$$-56x - 126 = -14$$

$$-56x = 126 - 14$$

$$\frac{-56x}{-56} = \frac{112}{-56}$$

$$x = -2$$

$$y = -8x - 21$$

$$y = -8(-2) - 21$$

$$y = 16 - 21$$

$$y = -5$$

$$(-2, -5)$$

A)

$$2x + 3y = 3$$

$$\underline{x - 3y = -12}$$

① Rearrange one of the equations to be either $y =$ or $x =$

$$x = 3y - 12$$

② Substitution



$$2(3y - 12) + 3y = 3$$

$$6y - 24 + 3y = 3$$

$$9y - 24 = 3$$

$$9y = 24 + 3$$

$$\frac{9y}{9} = \frac{27}{9}$$

$$y = 3$$

③ Fill in to one of the equations to find the other variable

$$x = 3y - 12$$

$$x = 3(3) - 12$$

$$x = 9 - 12$$

$$x = -3$$

$$\boxed{(-3, 3)}$$

B)

$$y = -2x + 4$$

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

$$-2x + 4$$

$$-6x - 3(-2x + 4) = 6$$

$$-6x + 6x - 12 = 6$$

$$0x - 12 = 6$$

$$0x = 12 + 6$$

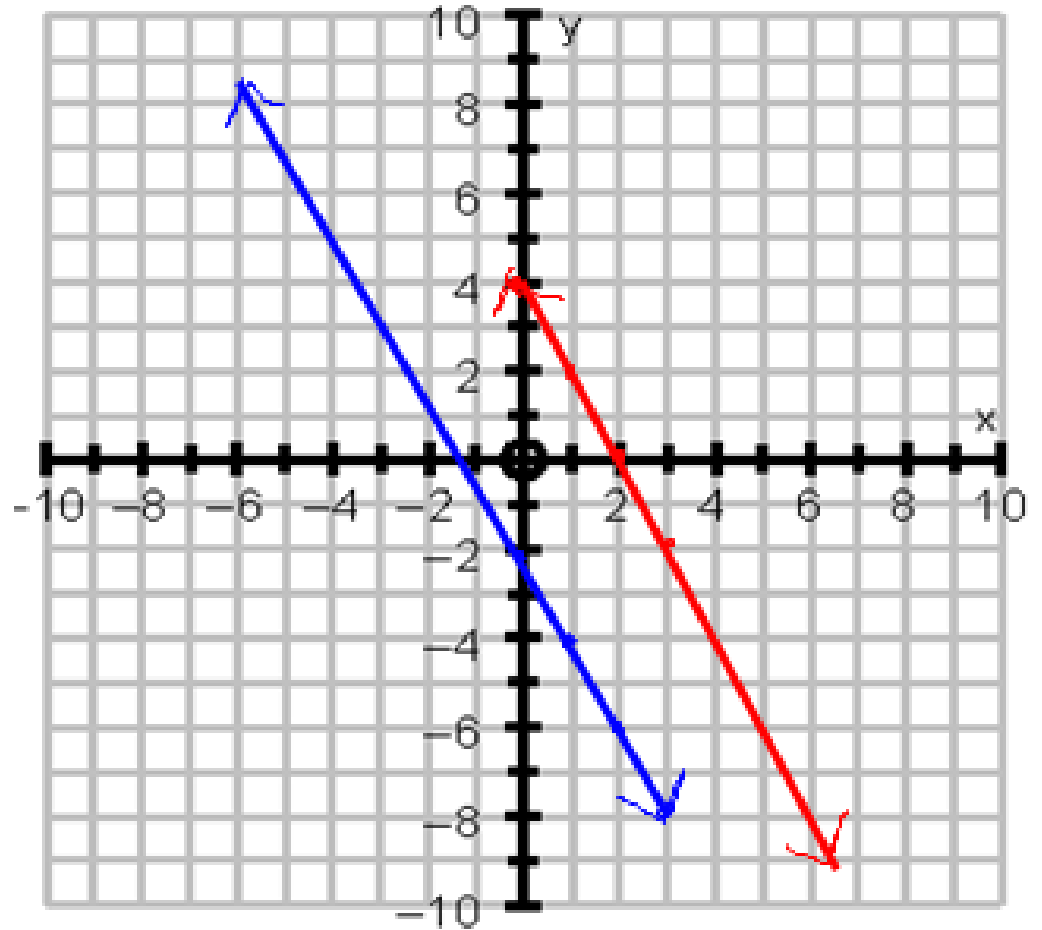
$$0x = 18$$

Not true! So there is **No Solution**

Why? Because they are parallel lines.

To graph $-6x - 3y = 6$ put in slope intercept form

$$y = -2x - 2$$



c)

$$14x - 2y = -4$$

$$-7x + y = 2 \rightarrow y = \underline{7x + 2}$$

$$14x - 2(7x + 2) = -4$$

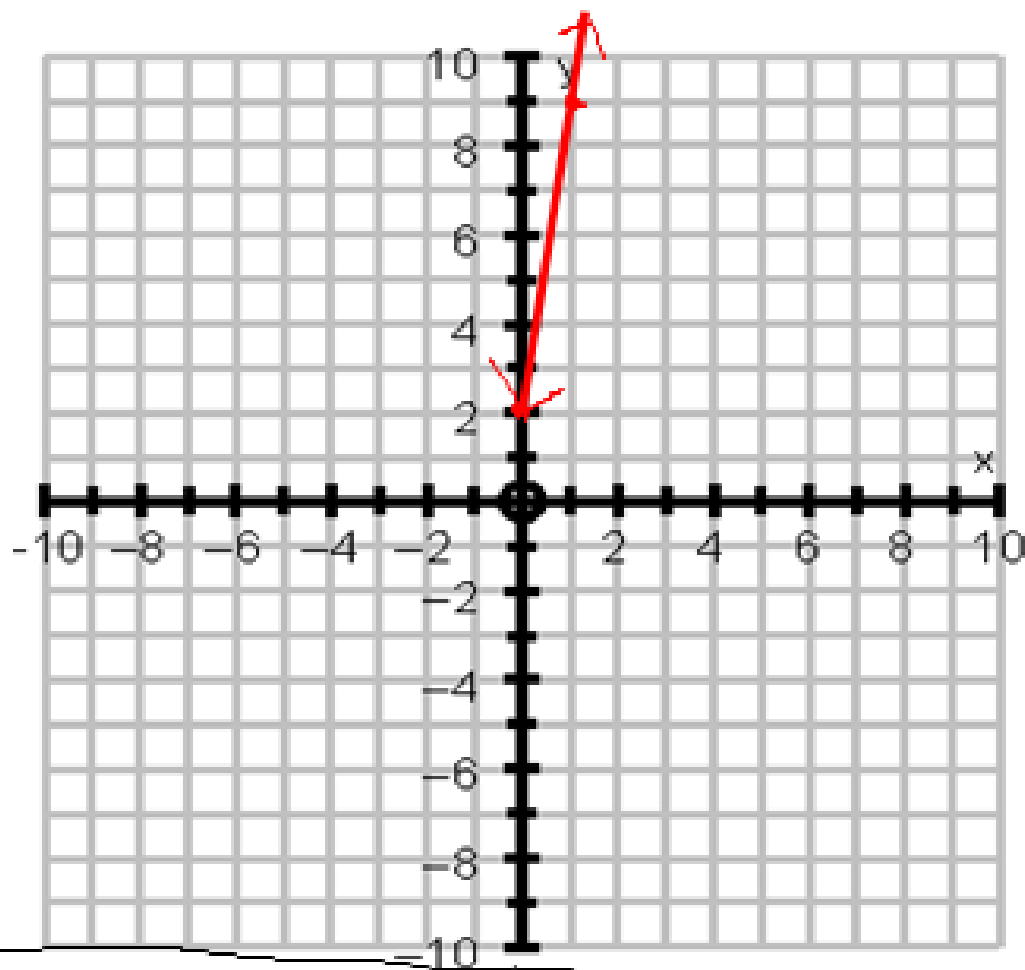
$$14x - 14x - 4 = -4$$

$$0x = -4 + 4$$

$$0x = 0$$

Always True.

Answer: INFINITE # OF SOLUTIONS



because they are the exact same line.

To graph $14x - 2y = -4$ rearrange to $y =$

$$\frac{-2y}{-2} = \frac{-14x - 4}{-2}$$

$$\rightarrow y = 7x + 2$$