

$$18) \quad -5x - y = 15$$

$$3x + 6y = -9$$

$$-1(-y) = (5x + 15)(-1)$$

$$y = -5x - 15$$

$$3x + 6(-5x - 15) = -9$$

solve for x

then solve for y

$$19) \quad -5x + 4y = -3$$

$$-5x - 5y = 15$$

$$-5x + 4y = -3$$

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

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

$$-5x - 5\left(\frac{5}{4}x - \frac{3}{4}\right) = 15$$

solve for x

then solve for y.

$$20) \begin{aligned} -6x + 3y &= -1 \rightarrow \\ 12x - 6y &= 4 \end{aligned}$$

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

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


$$12x - 6(2x - \frac{1}{3}) = 4$$

$$12x - 12x + 2 = 4$$

$$0x = 2$$

No solution

because parallel lines.



Solving by Elimination

Two equations can be simplified by adding them. This eliminates one of the variables so that the other variable can be found. → or subtracting them.

For example:

$$\begin{array}{r} 1. \quad 2x - 5y = 1 \\ + \quad 3x + 5y = 14 \\ \hline 5x + \cancel{0y} = 15 \\ 5x = 15 \\ \frac{5x}{5} = \frac{15}{5} \\ \boxed{x = 3} \end{array}$$

$-5y + 5y = 0$ ✓
↓
eliminates y

Goal: Get both equations to have the same coefficient for x or the same coefficient for y .

Use either original equation to find the other variable

$$2x - 5y = 1$$

$$2(3) - 5y = 1$$

$$6 - 5y = 1$$

$$-5y = 1 - 6$$

$$-5y = -5$$

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

$$\boxed{y = 1}$$

** Sometimes need to multiply one equation (or both) by a factor so that the variables eliminate.

$$\begin{array}{l} 3x + 2y = 4 \\ 2(x - y = 3) \end{array} \rightarrow \begin{array}{r} 3x + 2y = 4 \\ -3x - 3y = 9 \\ \hline 0x + 5y = -5 \end{array}$$

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

$$y = -1 \rightarrow$$

$$x - y = 3$$

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

$$x + 1 = 3$$

$$x = 2$$

$$\text{P.O.S. } (2, -1)$$

$$3. \quad x + 3y = -14$$

$$-(x + y = -6)$$

$$\hline \cancel{x} + 2y = -8$$

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

$$y = -4$$

→

$$x + y = -6$$

$$x + -4 = -6$$

$$x = -6 + 4$$

$$x = -2$$

$$(-2, -4)$$

$$\begin{array}{l} 2(3x + 5y = 5) = 6x + 10y = 10 \\ 4 \cdot 3(2x + 3y = 4) = -6x + 9y = 12 \end{array}$$

$$\cancel{0x} + y = -2$$

$$y = -2 \rightarrow$$

$$2x + 3y = 4$$

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

$$2x - 6 = 4$$

$$2x = 4 + 6$$

$$2x = 10$$

$$x = 5$$

$$(5, -2)$$