

Solve: $3x + 2y = 7$ $-2x$ $\frac{3}{3}x = \frac{7}{3} - \frac{2}{3}y$
 $-3x + 4y = 5$ $-4y$ $x = \frac{7}{3} - \frac{2}{3}y$
 $-\frac{3}{3}x = \frac{5}{-3} - \frac{4}{-3}y$
 $x = -\frac{5}{3} + \frac{4}{3}y$

Another method for solving linear systems is ELIMINATION.

1) **Graphing**

2) **Substitution**

The goal is to *eliminate* one of the variables by using addition OR multiplication with addition.

$$\begin{array}{r} \text{Solve: } 4x - 2y = 2 \\ + 3x + 2y = 12 \\ \hline 7x = 14 \end{array}$$

$$x = 2$$

$$(2, 3)$$

$$\begin{array}{r} 4(2) - 2y = 2 \\ 8 - 2y = 2 \\ -8 \quad -8 \\ \hline -2y = -6 \end{array}$$

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

$$y = 3$$

~~$$\begin{array}{r} y = 2x + 1 \\ 4x - 3y = 7 \end{array}$$~~

$$\begin{array}{r} 2x + 5y = -11 \\ -3x + 5y = -21 \end{array}$$

~~$$\begin{array}{r} -2x - 5y = 11 \\ -3x + 5y = -21 \\ \hline -5x = -10 \end{array}$$~~

$$(2, -3)$$

$$2(2) + 5y = -11$$

~~$$4 + 5y = -11$$~~

~~$$\frac{-5x}{-5} = \frac{-10}{-5}$$~~

$$x = 2$$

~~$$\frac{5y}{5} = \frac{-15}{5}$$~~

$$y = -3$$

Solve $-3p - q = -2$
 $2p - q = 3$

$\rightarrow 3p + q = 2$
 $+ 2p - q = 3$

$\hline 5p = 5$

$p = 1$

$(1, -1)$

$2(1) - q = 3$

$2 - q = 3$

$-q = 1$

$q = -1$

$6x + 2y = 2$

$-3x + 3y = -9 \rightarrow$

~~$6x + 2y = 2$~~

~~$-6x + 6y = -18$~~

$\hline 8y = -16$

$y = -2$

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

$6x - 4 = 2$

$\hline 6x = 6$

$x = 1$

$(1, -2)$

$$\begin{aligned}x + 3y &= 6 \\2x - 3y &= 12\end{aligned}$$

$$\frac{3x = 18}{3}$$

$$x = 6$$

$$(6, 0)$$

$$\begin{aligned}\cancel{6} + 3y &= \cancel{6} \\ \hline 3y &= 0\end{aligned}$$

$$y = 0$$

$$\begin{aligned}5x + 2y &= 17 \\3x + 2y &= 5\end{aligned}$$

$$(6, -6.5)$$

$$\begin{aligned}3(6) + 2y &= 5 \\18 + 2y &= 5 \\-\cancel{18} & \quad -\cancel{18} \\2y &= -13\end{aligned}$$

$$\begin{aligned}\cancel{5x} - \cancel{2y} &= \cancel{-17} \\3x + \cancel{2y} &= 5 \\ \hline -2x &= -12 \\ \hline -2 & \quad -2 \\ x &= 6\end{aligned}$$

$$\frac{2y}{2} = \frac{-13}{2} \quad y = -6.5$$

$$\begin{aligned}-3x + 2y &= -11 \\5x - y &= 23\end{aligned}$$

$$\begin{aligned}\xrightarrow{2} \begin{aligned}-3x + 2y &= -11 \\10x - 2y &= 46 \\ \hline 7x &= 35\end{aligned}\end{aligned}$$

$$\begin{aligned}5(5) - y &= 23 \\25 - y &= 23 \\-\cancel{25} & \quad -\cancel{25} \\-y &= -2 \\ \hline -1 & \quad -1 \\ y &= 2\end{aligned}$$

$$(5, 2)$$

$$\begin{aligned}2x - 5y &= 8 \\-3x + 4y &= 2\end{aligned}$$

$$\begin{aligned}\xrightarrow{3} \begin{aligned}6x - 15y &= 24 \\ \xrightarrow{2} \begin{aligned}-6x + 8y &= 4 \\ \hline -7y &= 28\end{aligned}\end{aligned}\end{aligned}$$

$$\begin{aligned}2x - 5(-4) &= 8 \\2x + 20 &= 8 \\-\cancel{20} & \quad -\cancel{20} \\2x &= -12 \\ \hline \frac{2x}{2} &= \frac{-12}{2} \\ x &= -6\end{aligned}$$

$$\begin{aligned}y &= -4 \\ (-6, -4)\end{aligned}$$

$$\begin{array}{r}
 3x + 7y = -29 \\
 4x + 3y = -7
 \end{array}
 \xrightarrow{\begin{array}{l} -3 \\ 7 \end{array}}
 \begin{array}{r}
 -9x - 21y = 87 \\
 +28x + 21y = -49 \\
 \hline
 19x = 38 \\
 \frac{19x}{19} = \frac{38}{19}
 \end{array}$$

$$x = 2$$

$$\begin{array}{r}
 4(2) + 3y = -7 \\
 8 + 3y = -7 \\
 -8 \quad -8 \\
 \hline
 3y = -15 \\
 \frac{3y}{3} = \frac{-15}{3} \\
 y = -5
 \end{array}$$

$$(2, -5)$$

$$\textcircled{18} \quad \begin{aligned} -2x + 6y &= 6 - 6y \\ -7x + 8y &= -5 \end{aligned}$$

$$\begin{aligned} -2x &= \frac{6}{-2} - \frac{6y}{-2} \\ x &= \underline{-3 + 3y} \end{aligned}$$

$$-7(-3 + 3y) + 8y = -5$$

$$21 - 21y + 8y = -5$$

$$\begin{aligned} 21 - 13y &= -5 \\ \hline -13y &= -26 \end{aligned}$$

$$\begin{aligned} \frac{-13y}{-13} &= \frac{-26}{-13} \\ y &= 2 \end{aligned}$$

$$\begin{aligned} -2x + 6(2) &= 6 \\ -2x + 12 &= 6 \\ \hline -2x &= -6 \\ \frac{-2x}{-2} &= \frac{-6}{-2} \end{aligned}$$

$$x = 3$$

$$(3, 2)$$