

6.4 Solving Systems by Elimination

Steps

1. Make the coefficients on a variable equal. *same # opposite signs*
2. Add or ~~subtract~~ the equations (eliminating a variable).
3. Solve for a variable.
4. Substitute the value from 3 into an original equation to solve for the other variable.
5. Write the solution as an **ordered pair**.
6. Verify

Ex.) Solve the following systems by elimination:

a) $2x + 7y = 13$, $3x - 7y = 2$

$$\begin{array}{r}
 2x + 7y = 13 \\
 + 3x - 7y = 2 \\
 \hline
 5x = 15 \\
 \hline
 x = 3
 \end{array}$$

$$\begin{array}{r}
 2(3) + 7y = 13 \\
 -6 + 7y = 13 \\
 7y = 19 \\
 y = \frac{19}{7}
 \end{array}$$

(3, 1)



Solve the following systems by:

a) Graphing:

$$\begin{array}{l}
 x = 2y + 7 \\
 -7 \quad +7 \\
 \hline
 \frac{1}{2}x + 7 = \frac{8}{2}y \\
 y_1 = \left(\frac{1}{2}\right)x + \left(\frac{7}{2}\right)
 \end{array}$$

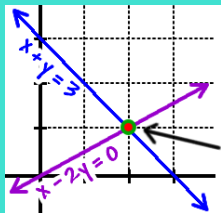
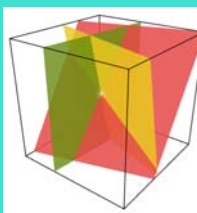
$$\begin{array}{l}
 0 = 3x - 4y + 8 \\
 +4y \quad +4y \\
 \hline
 \frac{4}{4}y = \frac{3x+8}{4} \\
 y_2 = \left(\frac{3}{4}\right)x + 2
 \end{array}$$

(6, 13/2) *exact values ⇒ no decimals*

b) Substitution:

$$\begin{array}{l}
 x = 2y + 10 \\
 \frac{1}{2}x = y + 5 \\
 x = 2(y + 5) \\
 3x + 6y + 1 = 0 \\
 3(2y + 5) + 6y + 1 = 0 \\
 6y + 15 + 6y + 1 = 0 \\
 12y = -16 \\
 \frac{12y}{12} = \frac{-16}{12} \\
 y = -\frac{4}{3}
 \end{array}$$

$$\begin{array}{l}
 x = 2(-4/3) + 5 \\
 x = 7/3 \\
 \hline
 \mathbf{\left(\frac{7}{3}, -\frac{4}{3}\right)}
 \end{array}$$

b) Elimination:

$$\begin{array}{r}
 -(2x + 6y = 6) \\
 \hline
 -2x - 6y = -6 \\
 + 2x + 3y = 4.5 \\
 \hline
 -3y = -1.5 \\
 \frac{-3y}{-3} = \frac{-1.5}{-3} \\
 y = \frac{1}{2}
 \end{array}$$

$$\begin{array}{r}
 2x + 3y = 4.5 \\
 2x + 3(\frac{1}{2}) = 4.5 \\
 2x + 1.5 = 4.5 \\
 2x = 3 \\
 x = \frac{3}{2}
 \end{array}$$

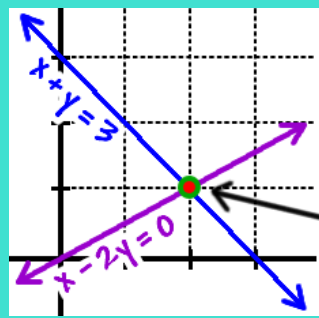
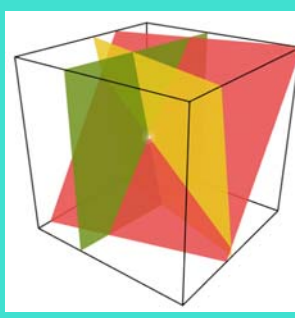
$\boxed{(\frac{3}{2}, \frac{1}{2})}$

c) $2x + 3y = 4$ $3(4x - y = 22)$

$$\begin{array}{r}
 2x + 3y = 4 \\
 + 12x - 3y = 66 \\
 \hline
 14x = 70 \\
 \frac{14x}{14} = \frac{70}{14} \\
 x = 5
 \end{array}$$

$$\begin{array}{r}
 2(5) + 3y = 4 \\
 10 + 3y = 4 \\
 -10 + 3y = -10 \\
 \frac{3y}{3} = \frac{-10}{3} \\
 y = -\frac{10}{3}
 \end{array}$$

$\boxed{(5, -2)}$

d) $3(5x + 3y = 3)$ $-5(3x - 7y = 81)$

$$\begin{array}{r}
 15x + 9y = 9 \\
 + -15x + 35y = -405 \\
 \hline
 44y = -396 \\
 y = -9
 \end{array}$$

$$\begin{array}{r}
 5x + 3(-9) = 3 \\
 5x - 27 = 3 \\
 + 27 \quad + 27 \\
 \hline
 5x = 30 \\
 \frac{5x}{5} = \frac{30}{5} \\
 x = 6
 \end{array}$$

$\boxed{(6, -9)}$