

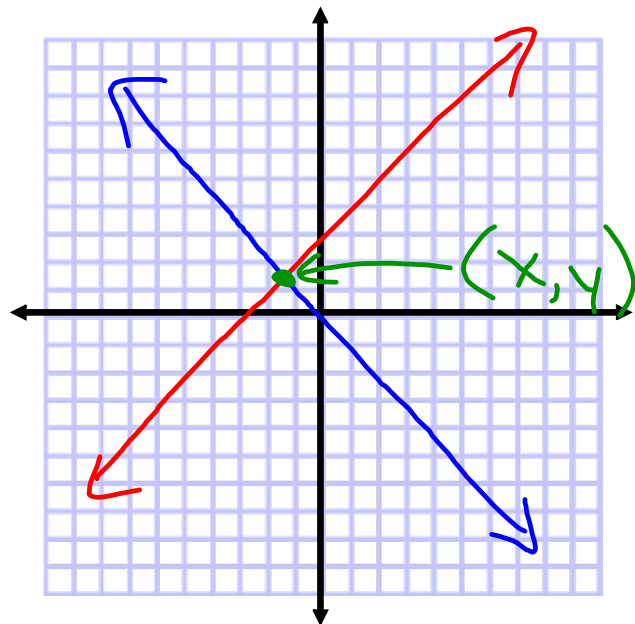
Feb. 7, 2018

Sect. 4-2

Solving Systems of Equations

Substitution

Elimination



How do we find the exact dot when it is in the "middle" of a square?

Substitution

$$2x - y = 9$$

$$\rightarrow x + 3y = -6$$

$$x + 3y = -6$$

$$\begin{array}{r} x + 3y = -6 \\ -3y \quad -3y \\ \hline x = -6 - 3y \end{array}$$

$$2(-6 - 3y) - y = 9$$

$$-12 - 6y - y = 9$$

$$-12 - 7y = 9$$

$$-7y = 21 \Rightarrow y = -3$$

$$\begin{aligned} x &= -6 - 3(-3) \\ &= -6 + 9 \end{aligned}$$

$$x = 3$$

$$(3, -3)$$

$$\begin{array}{l}
 3x + y = 7 \\
 4x + 2y = 16
 \end{array}$$

$$\begin{array}{l}
 y = 7 - 3(-1) \\
 y = 7 + 3 \\
 y = 10
 \end{array}$$

$$\begin{array}{r}
 3x + y = 7 \\
 -3x \quad -3x \\
 \hline
 y = 7 - 3x
 \end{array}$$

$$(-1, 10)$$

$$\begin{array}{l}
 4x + 2(7 - 3x) = 16 \\
 4x + 14 - 6x = 16 \\
 14 - 2x = 16 \\
 -14 \quad -14 \\
 \hline
 -2x = 2 \Rightarrow x = -1
 \end{array}$$

$$2x + y = 5$$

$$3x - 3y = 3$$

$$\begin{array}{r} 2x + y = 5 \\ -2x \quad -2x \\ \hline y = 5 - 2x \end{array}$$

$$3x - 3(5 - 2x) = 3$$

$$3x - 15 + 6x = 3$$

$$9x - 15 = 3$$

$$9x = 18$$

$$x = 2$$

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

$$y = 5 - 4$$

$$y = 1$$

$$(2, 1)$$

If you want to check your work, substitute your answers back into both original equations.

"Special" Answers

$$\begin{aligned} 2x - y &= 7 \\ 6x - 3y &= 14 \end{aligned}$$

$$\begin{array}{r} 2x - y = 7 \\ -2x \quad -2x \\ \hline -y = 7 - 2x \\ y = -7 + 2x \end{array}$$

$$\begin{aligned} 6x - 3(-7 + 2x) &= 14 \\ 6x + 21 - 6x &= 14 \\ 21 &= 14 \end{aligned}$$

Never
cross

"No Solution"

$$\begin{aligned}x + 3y &= 2 \\ 4x + 12y &= 8\end{aligned}$$

$$\begin{array}{r}x + 3y = 2 \\ -3y \quad -3y \\ \hline x = 2 - 3y\end{array}$$

$$\begin{aligned}4(2 - 3y) + 12y &= 8 \\ 8 - 12y + 12y &= 8 \\ 8 &= 8\end{aligned}$$

infinitely
many
solutions

Elimination

$$\begin{aligned} \times \quad & 2x - 4y = -26 \quad (\times 3) \\ & 3x - y = -24 \quad (\times 2) \end{aligned}$$

$$\begin{array}{r} 6x - 12y = -78 \\ -6x + 2y = 48 \\ \hline -10y = -30 \\ \frac{-10}{-10} \quad \frac{-30}{-10} \end{array}$$

$$y = 3$$

$$\begin{array}{r} 3x - 3 = -24 \\ \quad +3 \quad +3 \\ \hline 3x = -21 \\ \frac{3x}{3} = \frac{-21}{3} \\ x = -7 \end{array}$$

$$(-7, 3)$$

$$3x - y = 12 \quad (\times 2)$$

$$5x + 2y = 20 \quad (\text{nothing})$$

$$6x - 2y = 24$$

$$+ 5x + 2y = 20$$

$$11x = 44$$

$$x = 4$$

$$(4, 0)$$

$$3(4) - y = 12$$

$$12 - y = 12$$

$$\begin{array}{r} -12 \\ \hline -y = 0 \end{array}$$

$$y = 0$$

"Special" Answers

They look the same
as for substitution.