Study Guide

Equations Systems
03/01/2012

Equations: Systems

A system of equations contains at least two equations that may be linear, non-linear, or a combination of the two types. A graphical interpretation of the solution of a system of equations is that point (or points) where the graphs of the equations intersect. One method of finding the solution(s) of a system of equations involves adding the two equations together.

Example 1:

Starting Point

$3x + y = 13 \quad 2x - 4y = 18$

(1)

$$\begin{array}{r} 3x + y = 13 \\ +2x - 4y = 18 \\ \hline \end{array}$$

(2)

$$\begin{array}{r} 12x + 4y = 52 \\ +2x - 4y = 18 \\ \hline \end{array}$$

(3)

$$\begin{array}{r} 12x + 4y = 52 \\ +2x - 4y = 18 \\ \hline 14x + 0y = 70 \end{array}$$

(4)

$$\frac{14x}{14} = \frac{70}{14}$$

$$x = 5$$

(5)

$$\begin{array}{r} 2(5) - 4y = 18 \\ 10 - 4y = 18 \end{array}$$

(6)

$$\begin{array}{r} 10 - 4y = 18 \\ -10 \quad -10 \\ \hline -4y = 8 \end{array}$$

(7)

$$\frac{-4y}{-4} = \frac{8}{-4}$$

$$y = -2$$

Check Your Work

$3(5) + (-2) = 13 \quad 2(5) - 4(-2) = 18$

$15 - 2 = 13 \quad 10 + 8 = 18$

$13 = 13 \quad 18 = 18$

Step 1: Write the equations in a vertical format, aligning the x-terms, y-terms, equal signs, and constant terms.
Step 2: The objective is to add the corresponding parts of the two equations together and eliminate either the x- or y-term. Multiplying each term in the top equation by 4 will create the necessary conditions for eliminating the y-term.
Step 3: Add like terms in the two equations, and notice the resulting y-term will have a coefficient of zero and be eliminated.
Step 4: Solve the resulting equation for x. In this case, that means divide both sides of the equation by 14. This results with x = 5.
Step 5: To solve for y, substitute the value of x (5) in either of the original equations. The second equation was chosen for this example.
Step 6: Subtract 10 from both sides of the equation.
Step 7: Solve the resulting equation for y. In this case, that means divide both sides of the equation by -4. This results with y = -2.

As with all other equations, substitute the values of x and y into the original equations to ensure they are correct solutions.

Both values check out. Therefore, the solution to the system of equations are x = 5 and y = -2. This can be interpreted as the ordered pair (5, -2) of the point of intersection of the graphs of these two equations.