8.2 Solving Systems of Equations Algebraically (Part 1)

In this section we will learn two methods to solve systems of equations algebraically:

1) Substitution Method

2) Elimination Method

While mastery of both methods is not essential, it is beneficial to have experience using both methods as one is often more efficient than the other in certain circumstances.

Ex. 1 Solve the system

$$\begin{cases} 5x - y = 10 \\ x^2 + x - 2y = 0 \end{cases}$$

Using Substitution:

$$\begin{cases} 5x - y = 10 \\ x^2 + x - 2y = 0 \end{cases}$$

Using Elimination:

Example 2

Solve the following system of equations algebraically.

$3x + y = -9$

$4x^2 - x + y = -9$

Example 3 Solve $\begin{cases} 3x^2 - x - y - 2 = 0 \\ 6x^2 + 4x - y = 4 \end{cases}$

Example 4 Solve $\begin{cases} 6x^2 - x - y = -1 \\ 4x^2 - y = 4x - 6 \end{cases}$

Example 5 Solve $\begin{cases} x + y = 2 \\ 2x^2 - 8x - y = -11 \end{cases}$

Example 6 Solve $\begin{cases} \frac{1}{2}x^2 + 2x - y = \frac{3}{4} \\ 6x^2 - 12y - 9 = -24x \end{cases}$

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8.2 Solving Systems of Equations Algebraically (Part 2)

Ex.1 Determine two integers such that the sum of the smaller number and twice the larger number is 46. Also, when the square of the smaller number is decreased by three times the larger, the result is 93.

Ex. 2 A Canadian cargo plane drops a crate of emergency supplies to aid-workers on the ground. The crate drops freely at first before a parachute opens to bring the crate safely to the ground. The crates height,*h*, in meters, above the ground *t* seconds after leaving the airplane is given by the following two equations:

$h = -4.9t^2 + 700$ freefall

$h = -5t + 650$ after parachute opens

a) How long after the crate leaves the aircraft does the parachute open?

b) What height above the ground is the crate when the parachute opens?

Ex. 3 Terri makes a good hit and the baseball travels on a path modelled by $h = -0.1x^2 + 2x$. Ruth is in the outfield directly in line with the path of the ball. She runs toward the ball and jumps to try to catch it. Her jump is modelled by the equation $h = -x^2 + 39x - 378$. In both equations, *x* is the horizontal distance in meters from home plate and *h* is the height of the ball above the ground in meters. What is the solution to the system and what does it mean in reference to the scenario?

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