



Sadiq Public School

Subject: Mathematics Class: S3 Day: Saturday 16 November 2024

Theory of Quadratic Equations Chapter No.2

Inquiry: This lesson is about Simultaneous Equations .

What are Simultaneous Equations? How many types are there of simultaneous equations? What is the Simultaneous Equation approach? How can you solve the equations when both are quadratic equations?

Information:

How to solve quadratic simultaneous equations


1. Eliminate one of the variables.
2. Find the value of one variable.
3. Find the value of the remaining variables via substitution.
4. Clearly state the final answer/s.
5. Check your answer by substituting both values into either of the original equations.

What is the difference between simultaneous and quadratic equations?

Quadratic equations have two solutions, whereas simultaneous equations can have more than two solutions depending upon how many variables are involved. Simultaneous equations will always have real solutions whereas quadratic equations can have imaginary solutions.

Quadratic Equations

A **quadratic equation** is a quadratic expression that is equal to something. Quadratic equations contain terms up to x^2 – the highest power for a quadratic equation is 2

 Examples

$$\begin{array}{ll} x^2 = 5 & x^2 - 2x + 1 = 0 \\ x^2 - 16 = 0 & 2 = 2x^2 + 3x \end{array}$$

To solve a quadratic equation, we must set it equal to 0
A quadratic equation can have zero, one or two (real) solutions.

Example 2: Solve the equations $x^2 + y^2 + 2x = 8$ and $(x - 1)^2 + (y + 1)^2 = 8$

Solution: The given equations are (i)

$$x^2 + y^2 + 2x = 8 \quad \text{(i)}$$

$$(x - 1)^2 + (y + 1)^2 = 8 \quad \text{(ii)}$$

From equation (ii), we get

$$x^2 - 2x + 1 + y^2 + 2y + 1 = 8 \quad \text{(iii)}$$

or $x^2 + y^2 - 2x + 2y = 6$

Subtracting eq. (iii) from eq. (i), we have

$$4x - 2y = 2 \quad \text{or} \quad 2x - y = 1 \quad \text{(iv)}$$

$$\Rightarrow y = 2x - 1$$

Put the value of y in eq. (ii)

$$(x - 1)^2 + (2x - 1 + 1)^2 = 8$$

$$x^2 - 2x + 1 + 4x^2 - 8 = 0$$

$$5x^2 - 2x - 7 = 0$$

$$5x^2 - 7x + 5x - 7 = 0 \quad \text{or} \quad x(5x - 7) + 1(5x - 7) = 0$$

$$\Rightarrow (5x - 7)(x + 1) = 0$$

Either $5x - 7 = 0$ or $x + 1 = 0$, that is,

$$5x = 7 \Rightarrow x = \frac{7}{5} \quad \text{or} \quad x = -1$$

Now putting the values of x in eq. (iv), we have

When $x = \frac{7}{5}$

$$y = 2\left(\frac{7}{5}\right) - 1$$

$$y = \frac{14}{5} - 1 = \frac{14 - 5}{5} = \frac{9}{5}$$

When $x = -1$

$$y = 2(-1) - 1$$

Example 3: Solve the equations

$$x^2 + y^2 = 7 \quad \text{and} \quad 2x^2 + 3y^2 = 18.$$

Solution: Given equations are

$$x^2 + y^2 = 7 \quad \text{(i)}$$

$$2x^2 + 3y^2 = 18 \quad \text{(ii)}$$

Multiply equation (i) with 3

$$3x^2 + 3y^2 = 21 \quad \text{(iii)}$$

Subtracting equations (ii) from (iii)

$$x^2 = 3 \Rightarrow x = \pm\sqrt{3}$$

When $x = \sqrt{3}$, then from equation (i)

$$x^2 + y^2 = 7 \quad \text{or} \quad 3 + y^2 = 7 \Rightarrow y^2 = 4 \Rightarrow y = \pm 2$$

When $x = -\sqrt{3}$, then $y = \pm 2$

Thus, the required solution set is $\{(\pm\sqrt{3}, \pm 2)\}$.

Watch the video: <https://youtu.be/VXrFK9964zY?si=vbMLtYPCX0g5EAK3>

Practice: Solve the simultaneous equations from Exercise 2.7 Qno, 5, 6, 7