

9.5 Systems of Nonlinear Equations in Two Variables
Honors Algebra 2 with Trig

Systems of Nonlinear Equations in Two Variables

Ex 1: Solve the system using the substitution method.

A. $xy = -12$
 $x - 2y + 14 = 0$

$x = \frac{-12}{y}$
 $-\frac{12}{y} - 2y + 14 = 0$

$-12 - 2y^2 + 14y = 0$

$y^2 - 7y + 6 = 0$

$(y-6)(y-1) = 0$

solution set
 $\{(-2, 6), (-12, 1)\}$

$y = 6$
 $x = -2$

$y = 1$
 $x = -12$

B. $x^2 + y = 4$
 $2x + y = 1$

$y = 4 - x^2$
 $2x + (4 - x^2) = 1$

$0 = x^2 - 2x - 3$

$0 = (x-3)(x+1)$

$x = 3$ $x = -1$

$y = -5$ $y = 3$

solution set

$\{(3, -5), (-1, 3)\}$

Ex 2: Solve the system using the addition method.

A. $x^2 - 2y = 8$
 $-(x^2 + y^2 = 16)$

$-y^2 - 2y = -8$

$0 = y^2 + 2y - 8$

$0 = (y+4)(y-2)$

$y = -4$

$y = 2$

$x^2 - 2(-4) = 8$

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

$x^2 = 0$

$x^2 = 12$

$x = 0$

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

solution set

$\{(0, 4), (2\sqrt{3}, 2), (-2\sqrt{3}, 2)\}$

B. $3x^2 - 2y^2 = -5$
 $(2x^2 - y^2 = -2) - 2$

$3x^2 - 2y^2 = -5$

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

$-x^2 = -1$

$x = \pm 1$

$x = 1$

$x = -1$

$3 - 2y^2 = -5$

$3 - 2y^2 = -5$

$y^2 = 4$

$y = \pm 2$

$y = \pm 2$

solution set

$\{(1, 2), (1, -2), (-1, 2), (-1, -2)\}$

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The sum of two numbers is 20 and their product is 96, Find the two numbers.

$$x + y = 20 \quad x = 20 - y$$

$$xy = 96$$

$$(20 - y)y = 96$$

$$20y - y^2 = 96$$

$$0 = y^2 - 20y + 96$$

$$0 = (y - 12)(y - 8)$$

$$y = 12$$

$$y = 8$$

$$x = 8$$

$$x = 12$$

8 and 12

The difference between the squares of two numbers is 5. Twice the square of the second number subtracted from three times the square of the first number is 19. Find the numbers.

$$x^2 - y^2 = 5$$

$$3x^2 - 2y^2 = 19$$

$$x = 3$$

$$x = -3$$

$$9 - y^2 = 5$$

$$9 - y^2 = 5$$

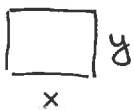
$$y = \pm 2$$

$$y = \pm 2$$

$$\begin{array}{r} 3x^2 - 2y^2 = 19 \\ -2x^2 + 2y^2 = -10 \\ \hline x^2 = 9 \\ x = \pm 3 \end{array}$$

3 and 2
3 and -2
-3 and 2
-3 and -2

Find the length and width of a rectangle whose perimeter is 60 feet and whose area is 144 square feet.



$$2x + 2y = 60 \Rightarrow x + y = 30$$

$$xy = 144 \quad x = \frac{144}{y}$$

$$\frac{144}{y} + y = 30$$

$$y = 6$$

$$y = 24$$

$$x = 24$$

$$x = 6$$

$$144 + y^2 = 30y$$

$$y^2 - 30y + 144 = 0$$

6 ft by 24 ft

$$(y - 24)(y - 6) = 0$$

$$y = 6, 24$$