January 21, 2020

- 4.3 - Other Systems of Equations - Day 2

EXAMPLE 3 Solving a Nonlinear System by the Addition Method

Solve the system:

$$\begin{cases} 4x^2 + y^2 = 13 & \text{Equation 1} \\ x^2 + y^2 = 10. & \text{Equation 2} \end{cases}$$

$-1(x^2 + y^2 = 10.)$

$+ \quad -x^2 - y^2 = -10$

$3x^2 = 3$

$\sqrt{x^2} = \sqrt{1}$

$x = \pm 1$

$x^2 + y^2 = 10$

$x = 1 : \quad 1^2 + y^2 = 10$

$y^2 = 9$

$y = \pm 3$

$x = -1 : \quad (-1)^2 + y^2 = 10$

$y^2 = 9$

$y = \pm 3$

Solutions:
(1, 3)
(1, -3)
(-1, 3)
(-1, -3)

HW 4.3 Day 2:
#'s: 20, 22, 24, 30, 32, 36, 38, 58, 61

Reminder:
TEST FRIDAY!

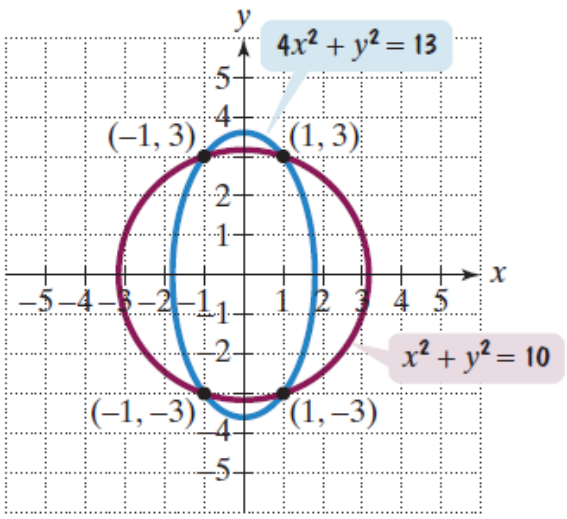


FIGURE 7.12 A system with four solutions

Check Point 3 Solve the system:

$$\begin{cases} 3x^2 + 2y^2 = 35 \\ 4x^2 + 3y^2 = 48. \end{cases}$$

$3(3x^2 + 2y^2 = 35)$

$-2(4x^2 + 3y^2 = 48.)$

$9x^2 + 6y^2 = 105$

$+\ -8x^2 - 6y^2 = -96$

$x^2 = 9$

$x = \pm 3$

$3x^2 + 2y^2 = 35$

$3(3)^2 + 2y^2 = 35$

$3(9) + 2y^2 = 35$

$27 + 2y^2 = 35$

$2y^2 = 8$

$y^2 = 4$

$y = \pm 2$

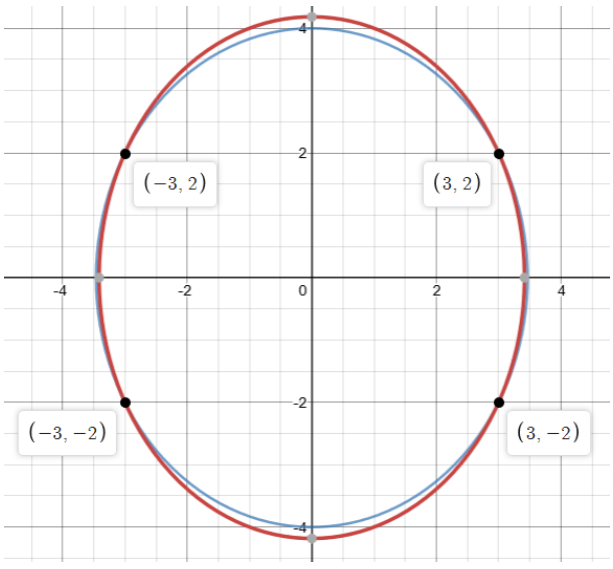
Solutions:

(3, 2)

(3, -2)

(-3, 2)

(-3, -2)



EXAMPLE 4 Solving a Nonlinear System by the Addition Method

Solve the system:

$$\begin{cases} y = x^2 + 3 & \text{Equation 1 (The graph is a parabola.)} \\ x^2 + y^2 = 9. & \text{Equation 2 (The graph is a circle.)} \end{cases}$$

$+ \quad -x^2 + y = 3$

$y^2 + y = 12$

$y^2 + y - 12 = 0$

$(y+4)(y-3) = 0$

$y = -4, \quad y = 3$

$x^2 + (3)^2 = 9$

$x^2 + 9 = 9$

$x^2 = 0$

$x = 0$

$(0, 3)$

$x^2 + y^2 = 9$

$(\quad, -4)$

$x^2 + (-4)^2 = 9$

$x^2 + 16 = 9$

$\sqrt{x^2} = \sqrt{-7}$

imaginary!

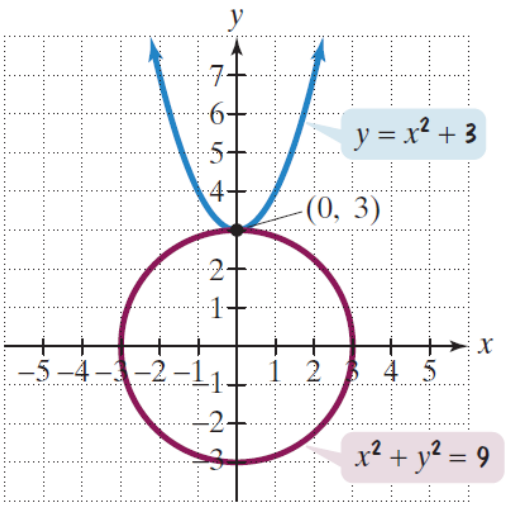


FIGURE 7.13 A system with one real solution

EXAMPLE 5 An Application of a Nonlinear System

You have 36 yards of fencing to build the enclosure in **Figure 7.14**. Some of this fencing is to be used to build an internal divider. If you'd like to enclose 54 square yards, what are the dimensions of the enclosure?

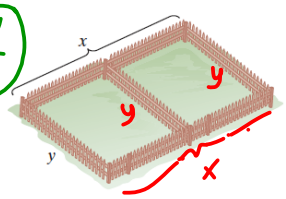


FIGURE 7.14 Building an enclosure

Area: $x \cdot y = 54$ $\rightsquigarrow$ $y = \frac{54}{x}$

Perimeter: $2x + 3y = 36$

sub.

$$2x + 3\left(\frac{54}{x}\right) = 36$$

$$x\left(2x + \frac{162}{x} = 36\right)$$

$$2x^2 + 162 = 36x$$

$$\frac{2x^2}{2} - \frac{36x}{2} + \frac{162}{2} = \frac{0}{2}$$

$$x^2 - 18x + 81 = 0$$

$$(x-9)(x-9) = 0$$

$x = 9$, $y = \frac{54}{x}$

$x = 9$, $y = \frac{54}{9}$

$x = 9$, $y = 6$

$x = 9$ yds., $y = 6$ yds.