

- 5.3 - Other Systems of Equations - Day 2

EXAMPLE 3 Solving a Nonlinear System by the Addition Method

Solve the system:

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

HW 5.3 Day 2:
 #'s: 20, 22, 24, 30,
 32, 36, 38, 58, 61

$x = -1$:

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

$$1 + y^2 = 10$$

$$\sqrt{y^2} = \sqrt{9}$$

$$y = \pm 3$$

$(-1, 3)$

$(-1, -3)$

$$3x^2 = 3$$

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

$$x = \pm 1$$

$x = 1$:

$$(1)^2 + y^2 = 10$$

$$1 + y^2 = 10$$

$$\sqrt{y^2} = \sqrt{9}$$

$$y = \pm 3$$

$(1, 3)$

$(1, -3)$

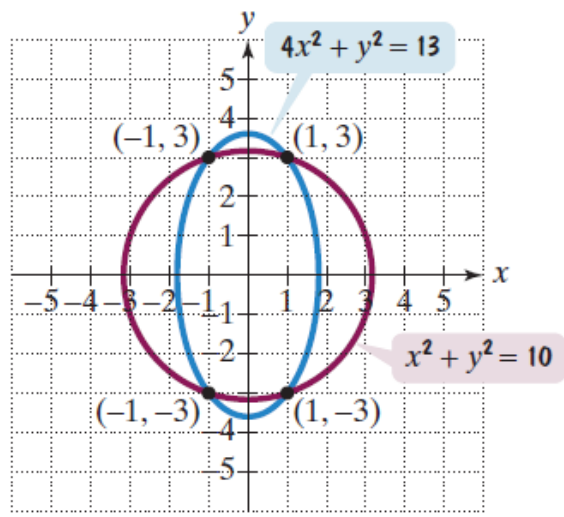


FIGURE 7.12 A system with four solutions

✓ Check Point 3 Solve the system:

$$\begin{aligned} 3(3x^2 + 2y^2 = 35) &\rightarrow 9x^2 + 6y^2 = 105 \\ -2(4x^2 + 3y^2 = 48) &\rightarrow -8x^2 - 6y^2 = -96 \\ \hline + & \end{aligned}$$

$$x=3:$$

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

$$27 + 2y^2 = 35$$

$$2y^2 = 8$$

$$\sqrt{y^2} = \sqrt{4}$$

$$y = \pm 2$$

$$(3, 2)$$

$$(3, -2)$$

$$(-3, 2)$$

$$(-3, -2)$$

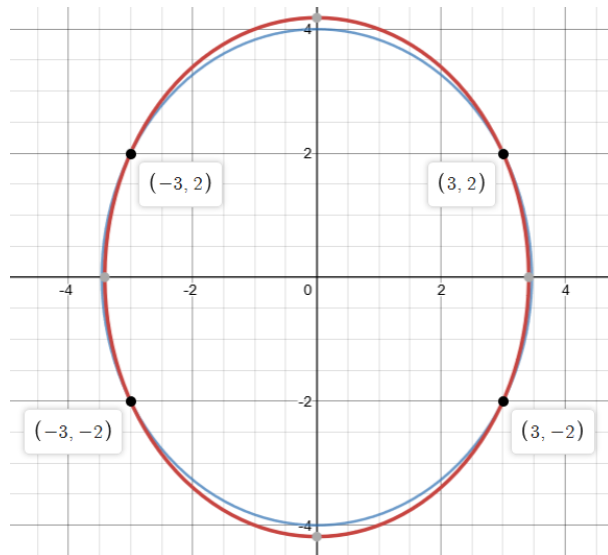
$$\sqrt{x^2} = \sqrt{9}$$

$$x = \pm 3$$

$$x = -3:$$

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

$$y = \pm 2$$



EXAMPLE 4 Solving a Nonlinear System by the Addition Method

Solve the system:

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

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

$$y^2 + y = 12$$

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

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

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

(0, 3)

$$y = x^2 + 3$$

$$y = -4: -4 = x^2 + 3$$

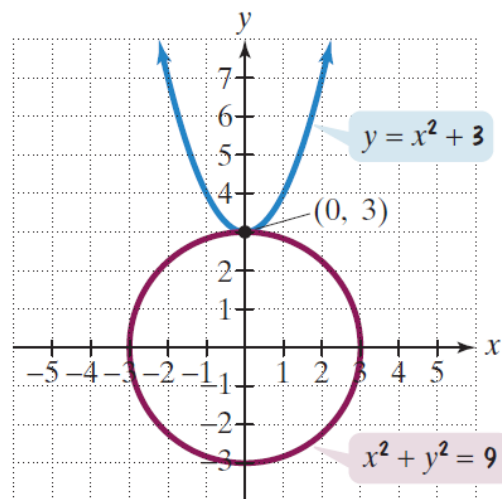
$$-7 = x^2$$

$$\pm \sqrt{-7} = x$$

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

$$0 = x^2$$

$$0 = x$$

**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?

$$\begin{cases} 2x + 3y = 36 \\ xy = 54 \end{cases} \rightarrow y = \frac{54}{x}$$

sub.

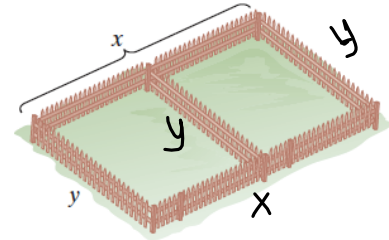


FIGURE 7.14 Building an enclosure

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

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

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

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

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

$$x = 9 \text{ yds.}$$

$$y = 6 \text{ yds.}$$