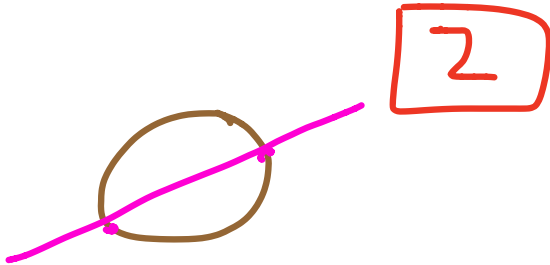


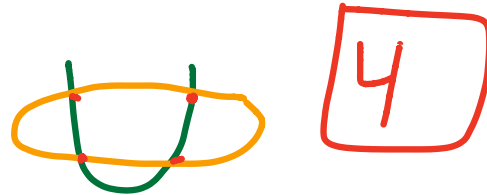
Solving Systems of Non-Linear Equations (7.4)

Analyzing Non-Linear Systems: Identify each equation. Indicate the maximum number of solutions.

1) $x - y + 1 = 0$ **Line**
 $x^2 + y^2 = 13$ **Circle**



2) $x^2 - y = 4$ **Parabola**
 $\frac{x^2}{4} + (y+2)^2 = 1$ **Ellipse**



Solving Systems by Substitution: Solve the system of equations by using substitution.

3) $x - y + 1 = 0 \rightarrow x = y - 1$
 $x^2 + y^2 = 13$

$$(y-1)^2 + y^2 = 13$$

$$y^2 - 2y + 1 + y^2 = 13$$

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

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

$$(y-3)(y+2)$$

$$y = 3, -2$$

$$(2, 3) \quad (-3, -2)$$

4) $x^2 - y = 4 \rightarrow x^2 = y + 4$
 $\frac{x^2}{4} + (y+2)^2 = 1$

$$\frac{y+4}{4} + (y+2)^2 = 1$$

$$y+4 + 4(y^2 + 4y + 4) = 4$$

$$y+4 + 4y^2 + 16y + 16 = 4$$

$$4y^2 + 17y + 16 = 0$$

$$y = \frac{-17 \pm \sqrt{289 - 256}}{8}$$

$$y = -1.4, -2.8$$

$$x = \pm 1.6, \pm 1.1$$

$$(1.6, -1.4) \quad (-1.6, -1.4)$$

$$(1.1, -2.8) \quad (-1.1, -2.8)$$

Solving Systems by Elimination: Solve the system of equations by using elimination.

5) $5x^2 - y^2 = 3 \rightarrow 10x^2 - 2y^2 = 6$
 $x^2 + 2y^2 = 5$

$$\begin{array}{r} 10x^2 - 2y^2 = 6 \\ x^2 + 2y^2 = 5 \\ \hline 11x^2 = 11 \end{array}$$

$$x = \pm 1$$

$$\begin{aligned} (\pm 1)^2 + 2y^2 &= 5 \\ 2y^2 &= 4 \\ y^2 &= 2 \\ y &= \pm \sqrt{2} \end{aligned}$$

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

6) $x^2 + y^2 = 25 \rightarrow -2x^2 - 2y^2 = -50$
 $3x^2 + 2y^2 = 59$

$$\begin{array}{r} -2x^2 - 2y^2 = -50 \\ 3x^2 + 2y^2 = 59 \\ \hline x^2 = 9 \end{array}$$

$$x = \pm 3$$

$$\begin{aligned} (\pm 3)^2 + y^2 &= 25 \\ y^2 &= 16 \\ y &= \pm 4 \end{aligned}$$

$$(3, 4) (3, -4) (-3, 4) (-3, -4)$$

Solving Systems of Non-Linear Equations: Solve the system of equations using any method.

7) $x^2 = y - 1 \rightarrow y = x^2 + 1$
 $2x^2 - y^2 = 3$

$$\begin{aligned} 2x^2 - (x^2 + 1)^2 &= 3 \\ 2x^2 - (x^4 + 2x^2 + 1) &= 3 \\ -x^4 - 1 &= 3 \\ \sqrt[4]{x^4} &= \sqrt[4]{4} \end{aligned}$$

No Solutions

8) $y = \log_3(x - 4)$
 $y = 2 - \log_3(x + 4)$

$$\begin{aligned} \log_3(x - 4) &= 2 - \log_3(x + 4) \\ \log_3(x - 4) + \log_3(x + 4) &= 2 \\ \log_3(x - 4)(x + 4) &= 2 \\ 3 \log_3(x^2 - 16) &= 6 \\ (x^2 - 16) &= 9 \\ x^2 &= 25 \\ x &= \pm 5 \end{aligned}$$

$$(5, 0)$$