

9.1 Solving Systems of Non-Linear Equations

Solving a system of non-linear equations is typically done using substitution. However, the elimination method or graphing are also viable options.

Example 1 Use substitution to find all solutions of the system of equations:
$$\begin{cases} x^2 - y = 8 \\ 2x^2 - 3y = 2x \end{cases}$$

Example 2 Use the elimination method to solve the system of equations:
$$\begin{cases} x^2 - y^2 = 1 \\ 2x^2 - y^2 = x + 3 \end{cases}$$

Example 3 Graph the two equations to determine how many solutions there are to the system of equations:
$$\begin{cases} x^3 - 2x^2 + y = 1 \\ 2x + y = 5 \end{cases}$$
. Find the solutions.

Example 4 Find an exponential function in the form $y = a e^{bx}$ that passes through the points (2, 4) and (5, 20). That is, find a and b .

Example 5 Use your calculator to find all solutions to the system of equations:
$$\begin{cases} xy = 4 \\ x^2 + y^2 - 4x - 13 = 0 \end{cases}$$

Example 6 Find all solutions to the system of equations:
$$\begin{cases} \frac{4}{x^2} + \frac{6}{y^2} = 10 \\ \frac{1}{x^2} - \frac{2}{y^2} = -1 \end{cases}$$

Example 7 Find all solutions to the system of equations:
$$\begin{cases} 2^x + 2^y = 10 \\ 4^x + 4^y = 68 \end{cases}$$