Section 9.3 Nonlinear Systems of Equations

A nonlinear system of equations is one in which one or more equations of the system are not linear equations. Each point of intersection of the graphs of the equations is a solution of the system of equations. If the graphs do not intersect, then the system of equations has no solution. To solve a nonlinear system of equations, use the substitution method or the elimination method.

Example 1 Solve \[
\begin{align*}
5x + y &= 3 \\
y &= x^2 - 3x - 5
\end{align*}
\]

Example 2 Solve \[
\begin{align*}
2x^2 + 3y^2 &= 21 \\
x^2 + 2y^2 &= 12
\end{align*}
\]

Example 3 Solve \[
\begin{align*}
9x^2 + 4y^2 &= 144 \\
x^2 + y^2 &= 9
\end{align*}
\]

Example 4 Solve \[
\begin{align*}
(x - 2)^2 + (y + 3)^2 &= 20 \\
(x - 3)^2 + (y + 2)^2 &= 10
\end{align*}
\]