

## College Algebra

### Module 13: Systems of Equations and Inequalities

## Methods for Solving a System of Nonlinear Equations

### LEARNING OUTCOMES

- Solve a system that represents the intersection of a parabola and a line using substitution.
- Solve a system that represents the intersection of a circle and a line using substitution.
- Solve a system that represents the intersection of a circle and an ellipse using elimination.

A **system of nonlinear equations** is a system of two or more equations in two or more variables containing at least one equation that is not linear. Recall that a linear equation can take the form  $Ax + By + C = 0$ . Any equation that cannot be written in this form is nonlinear. The substitution method we used for linear systems is the same method we will use for nonlinear systems. We solve one equation for one variable and then substitute the result into the second equation to solve for another variable, and so on. There is, however, a variation in the possible outcomes.

### Intersection of a Parabola and a Line

There are three possible types of solutions for a system of nonlinear equations involving a **parabola** and a line.

#### A GENERAL NOTE: POSSIBLE TYPES OF SOLUTIONS FOR POINTS OF INTERSECTION OF A PARABOLA AND A LINE

The graphs below illustrate possible solution sets for a system of equations involving a parabola and a line.

- No solution. The line will never intersect the parabola.
- One solution. The line is tangent to the parabola and intersects the parabola at exactly one point.
- Two solutions. The line crosses on the inside of the parabola and intersects the parabola at two points.

