

Solving a System of Quadratic Equations

- There are 4 possible scenarios when solving a quadratic-quadratic system

- 1. **There are no real solutions to the system**
 - When graphed, the parabolas never intersect
 - When solving algebraically, the variables cancel out and the remaining statement is false OR the resulting equation does not have real solutions.

Examples:

Solve:

$$\begin{aligned} 3x^2 &= y \\ -x^2 - 2x - 35 &= y \end{aligned}$$

2. There are infinitely many solutions to the system

- When graphed, the parabolas coincide (overlap)
- When solving algebraically, the variables cancel out and the remaining statement is true

Examples:

Solve:

$$(x-1)^2 - 9 = y$$

$$x^2 - 2x - 8 = y$$

3. There is one solution to the system

- When graphed, the parabolas either touch or intersect only once
- When solving algebraically, the variables raised to the power of two cancel out and the remaining equation is linear OR the resulting equation is a perfect square trinomial.

Examples:

Solve:

$$x^2 - 8x + 19 = y$$

$$x^2 - 16x + 59 = y$$

4. There are two solutions to the system

- When graphed, the parabolas intersect twice.
- When solving algebraically, the resulting equation has two solutions (the discriminant is positive).

Examples:

Solve:

$$y = 3x^2 + 30x + 74$$

$$x^2 + 10x + 28 = y$$