

## Section 10.4 Rotation of Conics

**Objective:** In this lesson you learned how to rotate the coordinate axis to eliminate the  $xy$ -term in equations of conics, use the discriminant to classify conics, and solve systems of quadratic equations.

Course Number

Instructor

Date

### Important Vocabulary

Define each term or concept.

#### Discriminant

### I. Rotation (Pages 722–725)

The general equation of a conic whose axes are rotated so that they are not parallel to either the  $x$ -axis or the  $y$ -axis contains a(n) \_\_\_\_\_.

To eliminate this term, you can use a procedure called \_\_\_\_\_, whose goal is to rotate the  $x$ - and  $y$ -axes until they are parallel to the axes of the conic.

The general second-degree equation

$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$  can be rewritten as

$A'(x')^2 + C'(y')^2 + D'x' + E'y' + F' = 0$  by rotating the

coordinate axes through an angle  $q$ , where

$\cot 2q =$  \_\_\_\_\_.

The coefficients of the new equation are obtained by making the substitutions  $x =$  \_\_\_\_\_ and  $y =$  \_\_\_\_\_.

#### *What you should learn*

How to rotate the coordinate axes to eliminate the  $xy$ -term in equations of conics

### II. Invariants Under Rotation (Pages 726–727)

**Invariant under rotation** means . . .

#### *What you should learn*

How to use the discriminant to classify conics

The rotation of the coordinate axes through an angle  $\theta$  that transforms the equation  $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$  into the form  $A'(x')^2 + C'(y')^2 + D'x' + E'y' + F' = 0$  has the following rotation invariants:

- 1)
- 2)
- 3)

The graph of the equation  $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$  is, except in degenerate cases, determined by its discriminant as follows:

- 1) Ellipse or circle if: \_\_\_\_\_
- 2) Parabola if: \_\_\_\_\_
- 3) Hyperbola if: \_\_\_\_\_

**Example 1:** Classify the graph of the following conic:

$$2x^2 + 12xy + 18y^2 - 3y - 5 = 0$$

### III. Systems of Quadratic Equations (Page 728)

To find the points of intersection of two conics, . . .

*What you should learn*  
How to solve systems of quadratic equations

**Example 2:** Solve the following system of quadratic equations:

$$\begin{cases} 4x^2 + 4y^2 - 36 = 0 \\ x^2 - 3y - 6x + 9 = 0 \end{cases}$$

#### Homework Assignment

Page(s)

Exercises