## Section 9.4    Rotation and Systems of Quadratic Equations

**Objective:** In this lesson you learned how to eliminate the *xy*-term in equations of conics and classify conics.

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**Important Vocabulary**                    Define each term or concept.

**Discriminant**

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**I. Rotation**  (Pages 690−693)

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) _____.

*What you should learn*
How to rotate the coordinate axes to eliminate the *xy*-term in equations of conics

To eliminate this term, you can use a procedure called _____ _____, whose objective 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 $\theta$, where

$\cot 2\theta = $ _____.

The coefficients of the new equation are obtained by making the

substitutions $x = $ _____ and

$y = $ _____.

**II. Invariants Under Rotation**  (Pages 694−695)

**Invariant under rotation** means . . .

*What you should learn*
How to use the discriminant to classify conics

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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 696)

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

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**Homework Assignment**

Page(s)

Exercises

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