Rotations of Conic Sections

Classify each conic section.

1) \(-u^2 + 2uv - v^2 + \sqrt{2} \cdot u + \sqrt{2} \cdot v = 0\)
2) \(37u^2 + 70uv + 37v^2 - 72 = 0\)

3) \(u^2 - 14uv + v^2 - 120 = 0\)
4) \(13u^2 + 10uv + 13v^2 - 288 = 0\)

Transform each equation from the \(xy\)-plane to the rotated \(uv\)-plane. The \(uv\)-plane's angle of rotation is provided.

5) \(x^2 + y = 0, \ \theta = 60^\circ\)
6) \(x^2 + 4y^2 - 36 = 0, \ \theta = 30^\circ\)

7) \(\frac{x^2}{16} + \frac{y^2}{36} = 1, \ \theta = 30^\circ\)
8) \(\frac{x^2}{16} - \frac{y^2}{16} = 1, \ \theta = 45^\circ\)

Eliminate the cross-product term by determining an angle of rotation between \(0^\circ\) and \(90^\circ\) and transforming the equation from the \(xy\)-plane to the rotated \(uv\)-plane.

9) \(37x^2 + 42\sqrt{3} \cdot xy + 79y^2 - 400 = 0\)
10) \(11x^2 + 10\sqrt{3} \cdot xy + y^2 - 64 = 0\)
Rotations of Conic Sections

Classify each conic section.
1) \(-u^2 + 2uv - v^2 + \sqrt{2} \cdot u + \sqrt{2} \cdot v = 0\)  
   Parabola

2) \(37u^2 + 70uv + 37v^2 - 72 = 0\)  
   Ellipse

3) \(u^2 - 14uv + v^2 - 120 = 0\)  
   Hyperbola

4) \(13u^2 + 10uv + 13v^2 - 288 = 0\)  
   Ellipse

Transform each equation from the \(xy\)-plane to the rotated \(uv\)-plane. The \(uv\)-plane's angle of rotation is provided.
5) \(x^2 + y = 0, \ \theta = 60^\circ\)  
   \(u^2 - 2\sqrt{3} \cdot uv + 3v^2 + 2\sqrt{3} \cdot u + 2v = 0\)

6) \(x^2 + 4y^2 - 36 = 0, \ \theta = 30^\circ\)  
   \(7u^2 + 6\sqrt{3} \cdot uv + 13v^2 - 144 = 0\)

7) \(\frac{x^2}{16} + \frac{y^2}{36} = 1, \ \theta = 30^\circ\)  
   \(31u^2 - 10\sqrt{3} \cdot uv + 21v^2 - 576 = 0\)

8) \(\frac{x^2}{16} - \frac{y^2}{16} = 1, \ \theta = 45^\circ\)  
   \(-2uv - 16 = 0\)

Eliminate the cross-product term by determining an angle of rotation between \(0^\circ\) and \(90^\circ\) and transforming the equation from the \(xy\)-plane to the rotated \(uv\)-plane.
9) \(37x^2 + 42\sqrt{3} \cdot xy + 79y^2 - 400 = 0\)  
   \(25u^2 + 4v^2 - 100 = 0, \ \theta = 60^\circ\)

10) \(11x^2 + 10\sqrt{3} \cdot xy + y^2 - 64 = 0\)  
    \(4u^2 - v^2 - 16 = 0, \ \theta = 30^\circ\)