MTH 385 2022-02-02 Worksheet

Exercise 1. *Why are the ellipse, hyperbola, and parabola called conic sections?*

Exercise 2. *For an ellipse, define the following terms.*

(a) center

(b) co-vertex

(c) focus

(d) major axis

(e) minor axis

(f) vertex

Exercise 3. *The standard equation for an ellipse is*

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

(Assume $a > b$.) Given an ellipse in the plane, how are the coordinate axes chosen so that an equation in this form holds? How are the constants a and b related to the notions in the previous exercise?

Exercise 4. *For a hyperbola, define the following terms.*

(a) asymptote

(b) center

(c) co-vertex

(d) conjugate axis

(e) focus

(f) transverse axis

(g) vertex

Exercise 5. *A standard equation for a hyperbola is*

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1.$$

Given a hyperbola in the plane, how are the coordinate axes chosen so that an equation in this form holds? How are the constants a and b related to the notions in the previous exercise?

Exercise 6. *For an parabola, define the following terms.*

(a) axis of symmetry

(b) directrix

(c) focus

(d) latus rectum

(e) vertex

Exercise 7. *A standard equation for a parabola is*

$$x^2 = 4py.$$

Given a parabola in the plane, how are the coordinate axes chosen so that an equation in this form holds? How is the constant p related to the notions in the previous exercise?

Exercise 8. *Given real numbers A, B, C, D, E, and F, can we determine whether the curve*

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

is an ellipse, a hyperbola, or a parabola? If so, how?