

Chapter 8 Conics and Parametric Equations

Section 8.1

Conic section – A figure formed by the intersection of a plane and a double-napped cone

Degenerate conic – A figure formed when a plane passes through the vertex of a double-napped cone

Parabola – The set of all points (x, y) in a plane that are equidistant from a fixed line and a fixed point not on the line

Directrix – A fixed line in the plane from which each point on a parabola is the same distance as the distance to a fixed point in the plane

Focus of a parabola – A fixed point in the plane from which each point on a parabola is the same distance as the distance to a fixed line in the plane

Vertex of a parabola – The midpoint between the focus and the directrix of the parabola

Axis of a parabola – The line passing through the focus and the vertex of the parabola

Standard form of the equation of a parabola – The standard form of the equation of a parabola with vertex at $(0, 0)$ and directrix $y = -p$ is

$$x^2 = 4py, \quad p \neq 0$$

For directrix $x = -p$, the equation is

$$y^2 = 4px, p \neq 0$$

Ellipse – The set of all points (x, y) in a plane the sum of whose distances from two distinct fixed points (foci) is constant

Foci of an ellipse – Two distinct fixed points in the plane such that the sum of the distances from each point on an ellipse to these points is constant

Vertices of an ellipse – Points of intersection of the line through the foci and the ellipse

Major axis – The chord connecting the vertices of an ellipse

Center of an ellipse – The midpoint of the major axis of an ellipse

Minor axis – The chord perpendicular to the major axis at the center of an ellipse

Standard form of the equation of an ellipse – The standard form of the equation of an ellipse centered at the origin with major and minor axes of lengths $2a$ and $2b$ (where $0 < b < a$) is

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

Hyperbola – The set of all points (x, y) in a plane the difference of whose distances from two distinct fixed points is a positive constant

Foci of a hyperbola – Two distinct fixed points in the plane such that the differences of the distances from each point on a hyperbola to these fixed points is a positive constant

Branches – The two disconnected parts of the graph of a hyperbola

Vertices of a hyperbola – Points of intersection of the line through the two foci and the hyperbola

Transverse axis – The line segment connecting the vertices of a hyperbola

Center of a hyperbola – The midpoint of the transverse axis of a hyperbola

Standard form of the equation of a hyperbola – The standard form of the equation of a hyperbola with center at the origin (where $a \neq 0$ and $b \neq 0$) is

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

Conjugate axis – The line segment of length $2b$ joining $(0, b)$ and $(0, -b)$ [or $(-b, 0)$ and $(b, 0)$]

Asymptotes of a hyperbola – The asymptotes of a hyperbola with center as $(0, 0)$ are $y = \pm \frac{b}{a}x$ for a

horizontal transverse axis or $y = \pm \frac{a}{b}x$ for a vertical transverse axis

Section 8.3

Parameter – A third variable t introduced into equations involving x and y that relates the position of a point to time

Parametric equations – Equations in which x and y are written as functions of a parameter t

Plane curve – If f and g are continuous functions of t on the interval I , the set of ordered pairs $(f(t), g(t))$ is a plane curve C

orientation – The direction of a plane curve determined by plotting the ordered pairs $(f(t), g(t))$ in the order of increasing values of t

Eliminating the parameter – The process of finding a rectangular equation from a parametric equation