Analyzing Conic Sections

Integration: Geometry (The Distance and Midpoint Formulas)

Distance Formula for Two Point in a Plane	The distance between two points with coordinates (x1, y1) and (x2, y2) is given by $d=\sqrt{(x2-x1)^\wedge 2+(y2-y1)^\wedge 2}$

Midpoint of a line Segment	If a line segment has endpoints at (x1, y2) and (x2, y2), then the midpoint of the line segment has coordinates $\left(\frac{x1+x2y}{2}, \frac{y1+y2}{2}\right)$

Parabolas

latus rectum - The line segment through the focus of a parabola and perpendicular to the axis of symmetry.

Information about Parabolas		
form of equation	$y = a(x-h)^\wedge 2 + k$	$x = a(y-k)^\wedge 2 + h$
axis of symmetry	$x = h$	$y = k$
vertex	(h, k)	(h, k)
focus	$\left(h, k+\frac{1}{4a}\right)$	$\left(h+\frac{1}{4a}, k\right)$
directrix	$y = k - \frac{1}{4a}$	$x = h - \frac{1}{4a}$
direction of opening	upward if $a > 0$ downward if $a < 0$	right if $a > 0$ left if $a < 0$
length of the latus rectum	$\left\lvert\frac{1}{a}\right\rvert$ units	$\left\lvert\frac{1}{a}\right\rvert$ units

Circles

circle - Set of all points in a plane that are equidistant from a given point in the plane called the center.
radius - Any segment whose endpoints are the center and a point on the circle. **tangent** - A line that intersects a circle in exactly one point is said to be tangent to the circle. **Equation of a Circle:** The equation of a circle with center (h, k) and radius r units is $(x-h)^\wedge 2+(y-k)^\wedge 2 = r^\wedge 2$.

Ellipses

ellipse - Set of all points in a plane such that the sum of all distances from the foci is constant.
major axis - The longer of the two line segments that form the axes of symmetry for and ellipse.
minor axis - The shorter of the two line segments that form the axes of symmetry for and ellipse. center of an ellipse - The intersection of the major and minor axes of an ellipse.
Standard Equations of Ellipses with Center at (*h, k*) - 1. The standard equation of an ellipse with its center at (h, k) and with a horizontal major axis is $\frac{(x-h)^\wedge 2}{a^\wedge 2}+\frac{(y-k)^\wedge 2}{b^\wedge 2}=1$ 2. The standard equation of an ellipse with its center at (h, k) and with a vertical major axis $\frac{(x-h)^\wedge 2}{b^\wedge 2}+\frac{(y-k)^\wedge 2}{a^\wedge 2}=1$

Hyperbolas

hyperbola - Set of all points in a plane such that the absolute value of the difference of the distance from any point on the hyperbola to two given points, called the foci is constant. **center of a hyperbola** - The intersection of the conjugate and transverse axes of a hyperbola. **asymptotes** - Lines that a curve approaches.
vertex - The point on each branch of a hyperbola that is nearest the center of the hyperbola.
transverse axis - One of two line segments that form the axes of symmetry for a hyperbola whose endpoints are the vertices of a hyperbola.
conjugate axis - The line segment that is perpendicular to the transverse axis at the center of a hyperbola and is an axis of symmetry of the hyperbola.
Standard Equations of Hyperbolas with Center at (h,k) - 1. The equation of a hyperbola with center at (h,k) and with a horizontal transverse axis is $\frac{(x-h)^\wedge 2}{a^\wedge 2}-\frac{(y-k)^\wedge 2}{b^\wedge 2}=1$ 2. The equation of a hyperbola with center at (h,k) and with a vertical transverse axis is $\frac{(y-k)^\wedge 2}{a^\wedge 2}-\frac{(x-h)^\wedge 2}{b^\wedge 2}=1$

Conic Section

Equation of a Conic Section	The equation of a conic section can be written in the form $Ax^\wedge 2 + Bxy + Cy^\wedge 2 + Dx + Ey + F = 0$, where A, B, and C are not all zero.

Ways to determine the type of conic section represented

Conic Section	Relationship of A and C
parabola	A = 0 or C = 0, but not both.
circle	A = C
ellipse	A and C have the same sign and A $\neq$ C.
hyperbola	A and C have opposite signs.