Algebra II Chapter 10 Toolkit

Parabolas

Definition: The set of all points in a plane that are the same distance from a given point called the focus and a given line called the directrix.

General Equation	$y = a(x-h)^2 + k$	$x = a(y-k)^2 + h$
Orientation	Opens up/down	Opens right/left
Axis of Symmetry	x = h	y = k
Location of Vertex	(h, k)	(h, k)
Location of Focus	$(h, k + \frac{1}{4a})$	$(h + \frac{1}{4a}, k)$
Equation of Directrix	$y = k - \frac{1}{4a}$	$x = h - \frac{1}{4a}$

Circles

Definition: The set of all points in a plane that are equidistant from a given point.

General Equation: $(x - h)^2 + (y - k)^2 = r^2$ where (h, k) is the center of the circle and r = radius

Ellipses

Definition: The set of all points P in a plane such that the *sum* of the distances between P and two distinct fixed points, called the foci, is a constant.

General Equation:

Horizontal ➔ $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ Vertical ➔ $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$

Where (h, k) is the center of the ellipse.

*a is always on the major axis

**The foci lie "c" units from the center and are given by the equation: $c^2 = a^2 - b^2$

Hyperbolas

Definition: The set of all points P in a plane such that the *difference* of the distances from P to two fixed points, called the foci, is constant.

General Equation:

Horizontal Transverse Axis ➔ $\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$ Vertical Transverse Axis ➔ $\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$

*Where (h, k) is the mid-point of the two vertices of the hyperbola.

*The vertices are located at ± a units from this mid-point and a is always located on the transverse axis.

***The foci of the hyperbola lie "c" units from the center and are given by the equation: $c^2 = a^2 + b^2$.*

**Basically, if the x^2 term is positive (first in the equation), then the hyperbola will open right & left. If the y^2 term is positive (first in the equation), then the hyperbola will open up and down.

**the slope of the asymptotes: $y = \pm\frac{b}{a}x$ (horizontal) $y = \pm\frac{a}{b}x$ (vertical)