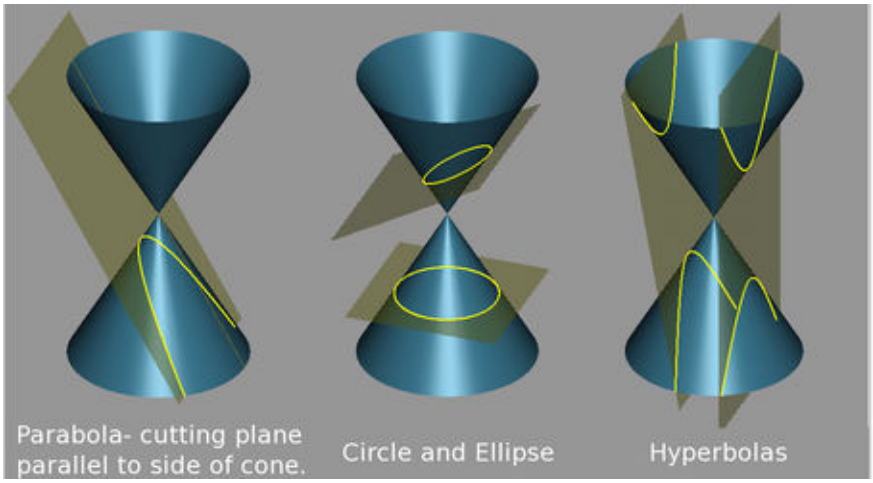
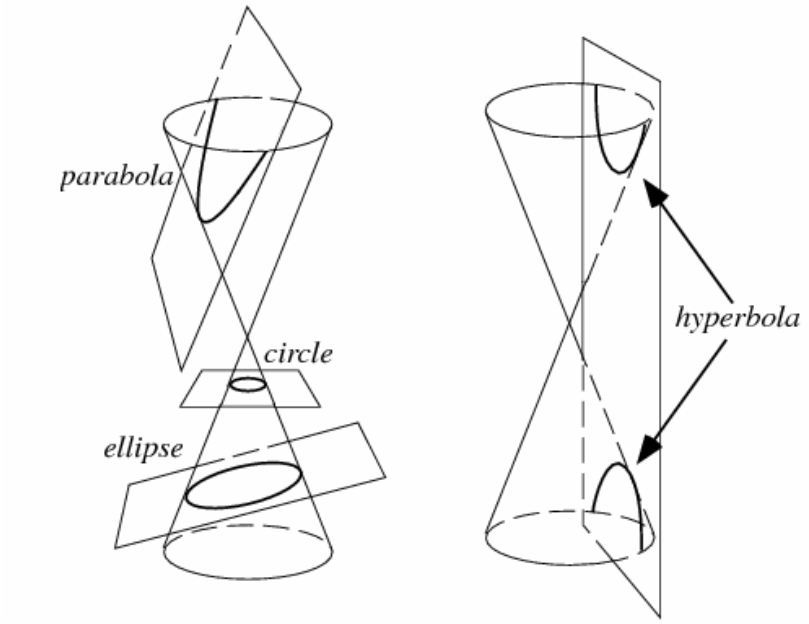
Math 150 Lecture Notes
Introduction to Conic Sections



http://en.wikipedia.org/wiki/Conic_section



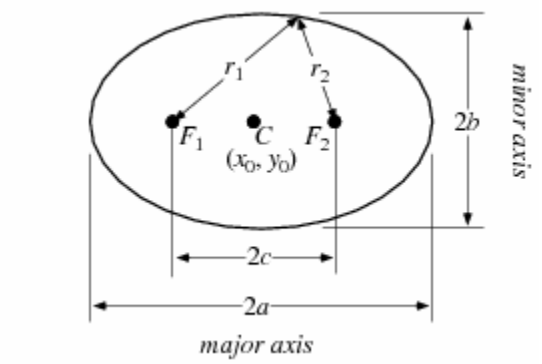
http://mathworld.wolfram.com/ConicSection.html

The general equation for a conic section is $Ax^2 + By^2 + Cxy + Dx + Ey + F = 0$.

Conditions	Resulting Equation	Type of Conic Section	Standard Form
$A = B;\ C = 0$	$Ax^2 + Ay^2 + Dx + Ey + F = 0$		$(x-h)^2 + (y-k)^2 = r^2$
$A = C = D = 0$ Or $B = C = E = 0$	$By^2 + Ey + F = 0$ Or $Ax^2 + Dx + F = 0$		$y = a(x-h)^2 + k$ Or $x = a(y-k)^2 + h$
A and B are both positive and $A \neq B$	$Ax^2 + By^2 + Cxy + Dx + Ey + F = 0$		$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ Or $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$
A and B have different signs	$Ax^2 + By^2 + Cxy + Dx + Ey + F = 0$		$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$ Or $\frac{(x-h)^2}{b^2} - \frac{(y-k)^2}{a^2} = 1$

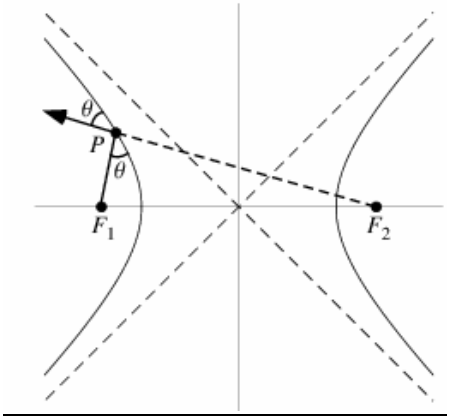
A **parabola** is a set of points in the plane equidistant from a fixed point P (called the **focus**) and a fixed line l (called the **directrix**). The **vertex** V of the parabola lies halfway between the focus and the directrix; the **axis of symmetry** is the line that runs through the focus perpendicular to the directrix.

A **ellipse** is the set of all points in the plane the sum of whose distances from two fixed points F_1 and F_2, the **foci**, is a constant.



http://mathworld.wolfram.com/Ellipse.html

A **hyperbola** is the set of all points in the plane, the difference of whose distances from two fixed points F_1 and F_2 is a constant. These two fixed points are the **foci** of the hyperbola.



http://en.wikipedia.org/wiki/Hyperbola

Example 1: Find the vertices and graph the conic: $8y^2 + 12x = 0$

Example 2: Find the vertices and graph the conic: $9x^2 - 4y^2 - 18x - 16y - 43 = 0$

Example 3: Find the vertices and graph the conic: $9x^2 + 4y^2 - 18x + 16y - 11 = 0$

Practice Problems:
http://www.algebralab.org/lessons/lesson.aspx?file=Algebra_conics_circle.xml
http://www.algebralab.org/lessons/lesson.aspx?file=Algebra_conics_ellipse.xml
http://www.algebralab.org/lessons/lesson.aspx?file=Algebra_conics_hyperbola.xml