Conic Sections and Quadric Surfaces
Part I

CONIC SECTIONS

Intersection of a cone with a plane

1. point
2. line
3. circle
4. ellipse
5. Hyperbola
6. parabola
7. Double line

In general, an equation of a conic section is given by: $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$

1. $B^2 - 4AC < 0 \iff$ Ellipse, circle, or no curve

2. $B^2 - 4AC = 0 \iff$ Parabola, 2 parallel lines one line or no curve

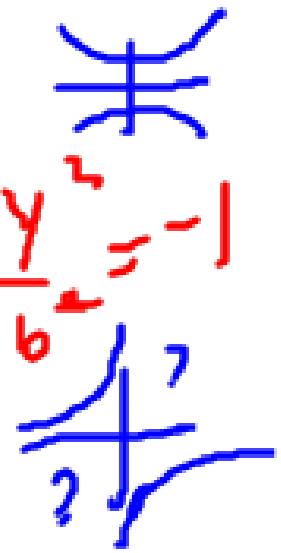
3. $B^2 - 4AC > 0 \iff$ Hyperbola, 2 intersecting lines.

1. Circle: $x^2 + y^2 = r^2$

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

3. Hyperbola: $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1, \quad \frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$

or $xy = c.$



4. Parabola:

$y^2 = ax, \quad x = by^2$