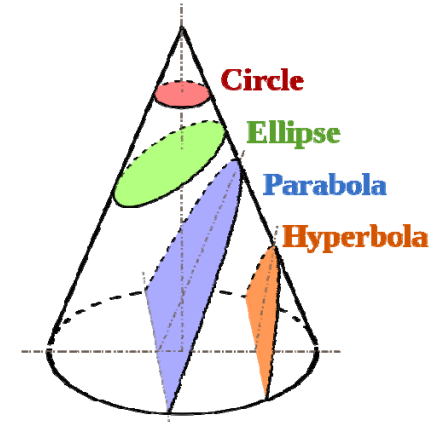
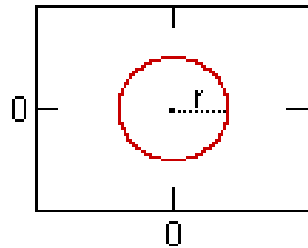


**Circle**

$$(x-h)^2 + (y-k)^2 = r^2,$$

Center:  $(h, k)$ ,

Radius:  $r$ .



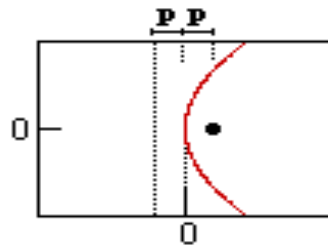
**Parabola**

$$(y-k)^2 = 4p(x-h),$$

Directrix: Vertical,

Vertex:  $(h, k)$ ,

Focus:  $(h+p, k)$ , dir:  $x = h-p$ .



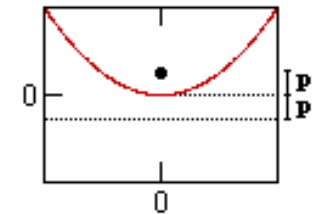
**Parabola**

$$(x-h)^2 = 4p(y-k),$$

Directrix: Horizontal,

Vertex:  $(h, k)$ ,

Focus:  $(h, k+p)$ , dir:  $y = k-p$ .



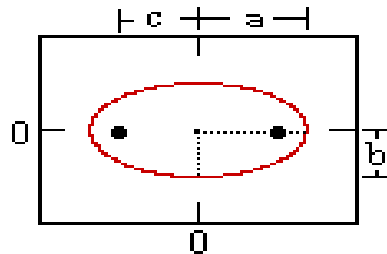
**Ellipse**

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

Major axis: Horizontal,

$c^2 = a^2 - b^2$ , Center:  $(h, k)$ ,

Vertices:  $(h \pm a, k)$ , Foci:  $(h \pm c, k)$ .



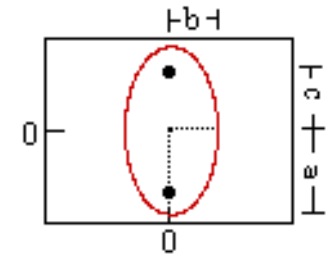
**Ellipse**

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

Major axis: Vertical,

$c^2 = a^2 - b^2$ , Center:  $(h, k)$ ,

Vertices:  $(h, k \pm a)$ , Foci:  $(h, k \pm c)$ .



**Hyperbola**

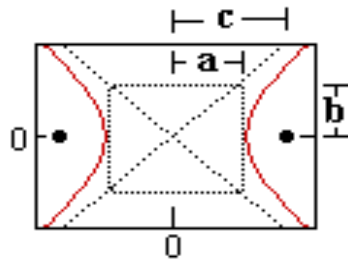
$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1,$$

Main axis: Horizontal,

$c^2 = a^2 + b^2$ , Center:  $(h, k)$ ,

Vertices:  $(h \pm a, k)$ , Foci:  $(h \pm c, k)$ ,

Asy:  $y - k = \pm \left(\frac{b}{a}\right)(x - h)$ .



**Hyperbola**

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1,$$

Main axis: Vertical,

$c^2 = a^2 + b^2$ , Center:  $(h, k)$ ,

Vertices:  $(h, k \pm a)$ , Foci:  $(h, k \pm c)$ ,

Asy:  $y - k = \pm \left(\frac{a}{b}\right)(x - h)$ .

