Math 110 **Conic Sections** **Banimahd, Arman**

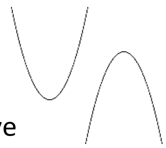
Parabola:

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

Vertex: (h,k)

Opens up if p is positive

Opens down if p is negative



Focus: $(h, k+p)$

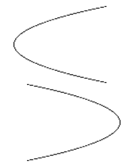
Directrix: $y = k - p$

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

Vertex: (h,k)

Opens right if p is positive

Opens left if p is negative



Focus: $(h+p, k)$

Directrix: $x = h - p$

Circle:

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

Ellipse:

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

Center: (h,k) Vertices: $(h-a,k)$, $(h+a,k)$, $(h,k-b)$, $(h,k+b)$ $c = \sqrt{|a^2 - b^2|}$

if $a > b$,

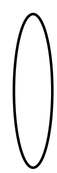
foci: $(h-c,k)$, $(h+c,k)$

horizontal major axis with length $2a$, and vertical minor axis with length $2b$

if $a < b$,

foci: $(h,k-c)$, $(h,k+c)$

vertical major axis with length $2b$, and horizontal minor axis with length $2a$



Hyperbola:

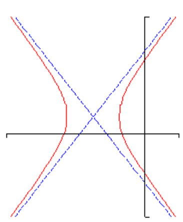
Center: (h,k) $c = \sqrt{a^2 + b^2}$ Asymptotes: $y = \frac{b}{a}(x-h) + k$, $y = -\frac{a}{b}(x-h) + k$

If the term with x is positive when equal to 1,

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

Vertices: $(h-a,k)$, $(h+a,k)$

Foci: $(h-c,k)$, $(h+c,k)$



If the term with y is positive when equal to 1,

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

Vertices: $(h,k-b)$, $(h,k+b)$

Foci: $(h,k-c)$, $(h,k+c)$