Equation Sheet: Conic Sections

Parabolas

	Horizontal Direction of Opening	**Vertical Direction of Opening**
Equation	$4p(x-h)=(y-k)^2$	$4p(y-k)=(x-h)^2$
Axis of Symmetry	$y=k$	$x=h$
Vertex	(h,k)	(h,k)
Focus	$(h+p,k)$	$(h,k+p)$
Directrix	$x=h-p$	$y=k-p$

Circles

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

Ellipses

	Horizontal Major Axis	**Vertical Major Axis**
Equation	$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$	$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$
Center	(h,k)	(h,k)
Co-Vertices	$(h,\ k\pm b)$	$(h\pm b,\ k)$
Vertices	$(h\pm a,k)$	$(h,k\pm a)$
Major Axis	$y=k, length\ of\ 2a$	$x=h, length\ of\ 2a$
Minor Axis	$x=h, length\ of\ 2b$	$y=k, length\ of\ 2b$
Foci	$(h\pm c,k)$	$(h,k\pm c)$

a is the distance from center to vertices, b is the distance from center to co-vertices,
c is the distance from center to foci, $c^2=a^2-b^2$

Hyperbolas

	Horizontal Transverse Axis	**Vertical Transverse Axis**
Equation	$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$	$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$
Equations of Asymptotes	$y-k=\pm\frac{b}{a}(x-h)$	$y-k=\pm\frac{a}{b}(x-h)$
Center	(h,k)	(h,k)
Vertices	$(h\pm a,k)$	$(h,k\pm a)$
Transverse Axis	$y=k, length\ of\ 2a$	$x=h, length\ of\ 2a$
Conjugate Axis	$x=h, length\ of\ 2b$	$y=k, length\ of\ 2b$
Foci	$(h\pm c,k)$	$(h,k\pm c)$

a is the distance from center to vertices, b is the distance from center to co-vertices,
c is the distance from center to foci, $c^2=a^2+b^2$

Discriminant: b^2-4ac