

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	$y = k, \text{length of } 2a$	$x = h, \text{length of } 2a$
Minor Axis	$x = h, \text{length of } 2b$	$y = k, \text{length of } 2b$
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	$y = k, \text{length of } 2a$	$x = h, \text{length of } 2a$
Conjugate Axis	$x = h, \text{length of } 2b$	$y = k, \text{length of } 2b$
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: $B^2 - 4AC$

Sequences & Series

$$a_n = a_1 + (n - 1)d$$

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$a_n = a_1(r)^{n-1}$$

$$S_n = a_1 \left(\frac{1-r^n}{1-r} \right)$$

$$S = \frac{a_1}{1-r}$$

Exponential Growth & Decay

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$A = Pe^{rt}$$

$$A(t) = N_0(1 + r)^t$$

