Conics

Circle

Standard Form

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

Center = (h,k)
Radius = r
Vertices: (h±r, k) and (h, k±r)
Domain = [h-r, h+r]
Range = [k-r, k+r]

General Form

$x^2+y^2+Dx+Ey+F=0$

Center = $\left(-\frac{D}{2},-\frac{E}{2}\right)$

Radius = $\sqrt{-F+\left(\frac{D}{2}\right)^2+\left(\frac{E}{2}\right)^2}$

Parabola

Standard Form

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

Vertex = (h,k)
Focal length = a
Focus = (h, k+a)
Directrix: y = k-a
Axis of symmetry: x = h

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

Vertex = (h,k)
Focal length = a
Focus = (h+a, k)
Directrix: x = h-a
Axis of symmetry: y = k

Ellipse

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

Vertices: (±a, 0) and (0, ±b)

Focal length: $c^2=\left|a^2-b^2\right|$

Foci: (±c, 0) if a > b
(0, ±c) if b > a

Domain = [-a, a]
Range = [-b, b]

Lines

Slope: $m=\frac{y_2-y_1}{x_2-x_1}$

Slope y-intercept form: y = mx + b

Slope Point form: $m=\frac{y-y_1}{x-x_1}$

Perpendicular Lines: $m_2=\frac{-1}{m_1}$

Hyperbola

$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

Vertices: (±a, 0)
Focal Length: $c^2=a^2+b^2$
Foci: (±c, 0)
Asymptotes: $y=\pm\frac{b}{a}x$
Domain = $-\infty,-a]\cup[a,+\infty$
Range = $-\infty,+\infty$

$\frac{y^2}{b^2}-\frac{x^2}{a^2}=1$

Vertices: (0, ±b)
Focal Length: $c^2=a^2+b^2$
Foci: (0, ±c)
Asymptotes: $y=\pm\frac{b}{a}x$
Domain = $-\infty,+\infty$
Range = $-\infty,-b]\cup[b,+\infty$