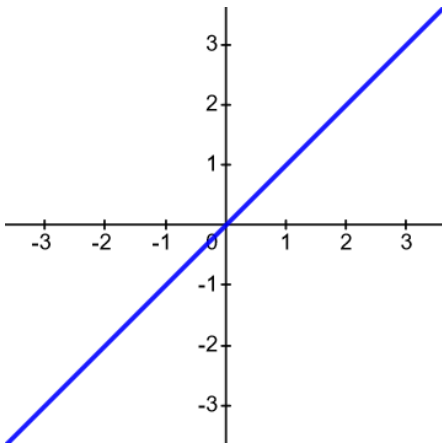# Parent Functions and Graphs
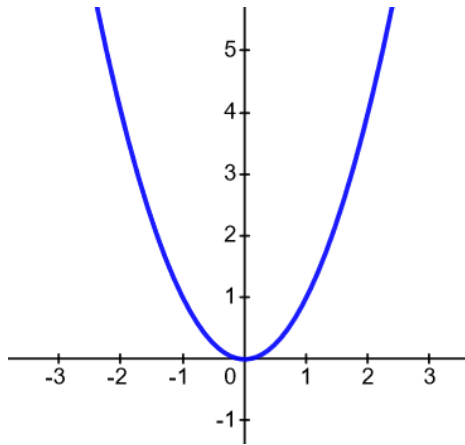
Linear
$$y = x$$
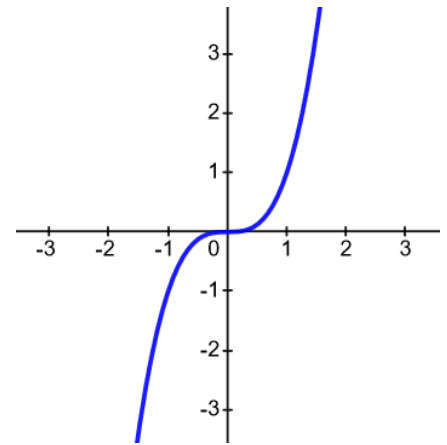
Quadratic (Parabola)
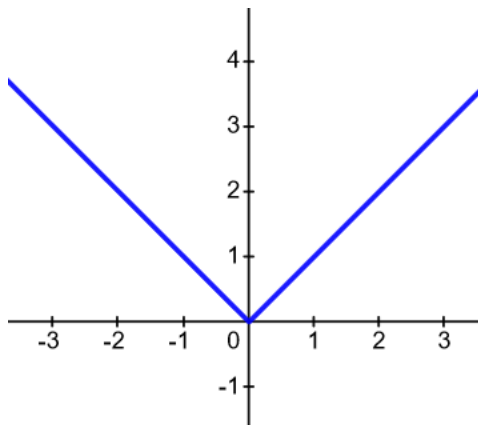$$y = x^2$$

Cubic
$$y = x^3$$

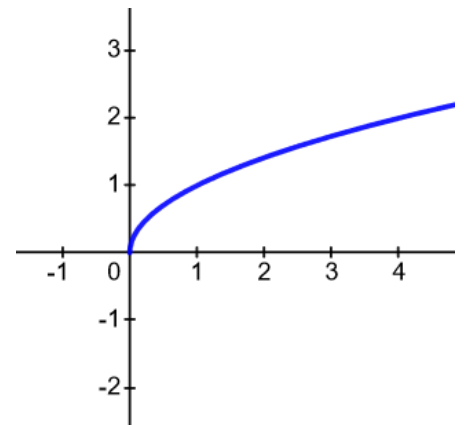### Constant (Horizontal Line)
$$y = c$$
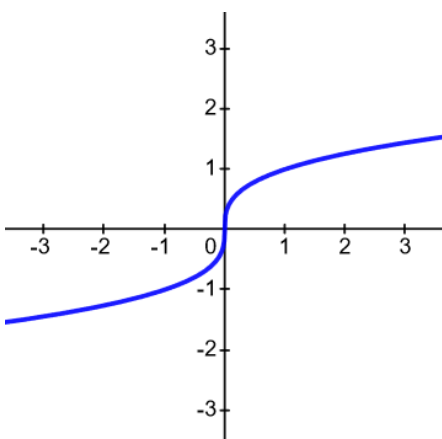
$y = 1$
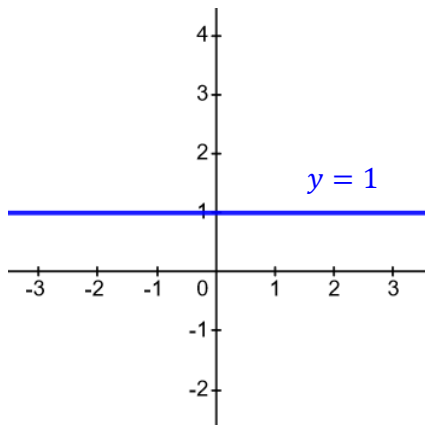
Absolute Value
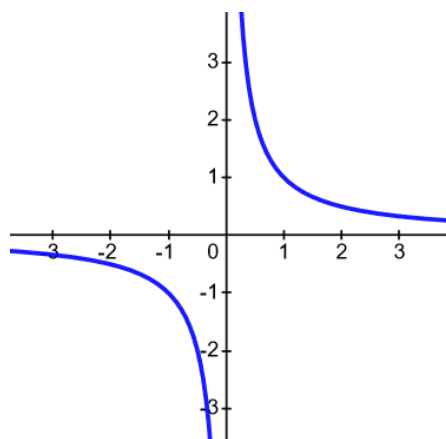$$y = |x|$$

Square Root
$$y = \sqrt{x}$$

Cube Root
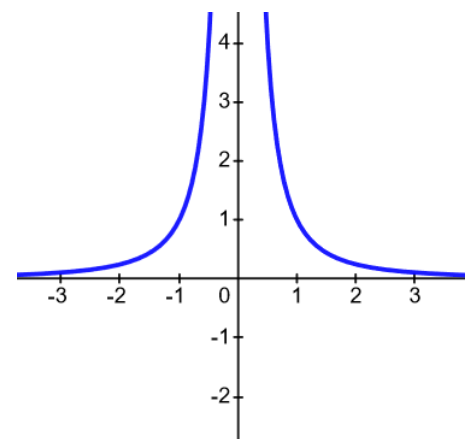$$y = \sqrt[3]{x}$$
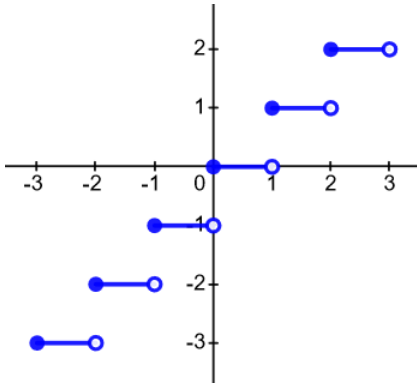
Rational
$$y = \frac{1}{x}$$

Rational (Squared)
$$y = \frac{1}{x^2}$$

Parent Functions and Graphs

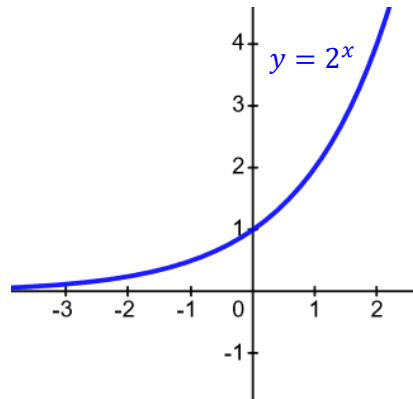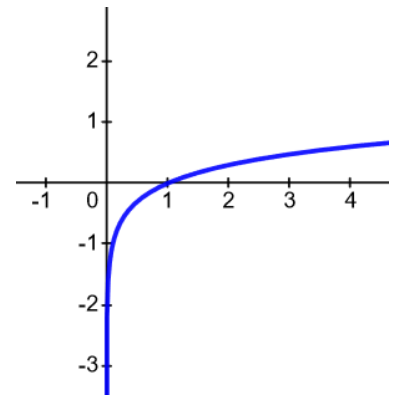### Greatest Integer (Step Function)
$$y = [\![x]\!]$$
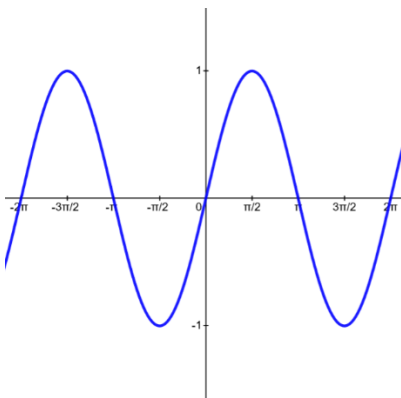
Exponential
$$y = b^x$$
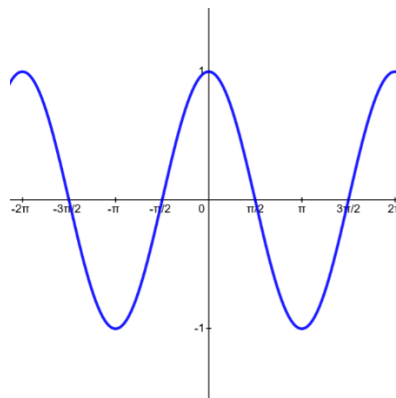
$y = 2^x$

Logarithmic
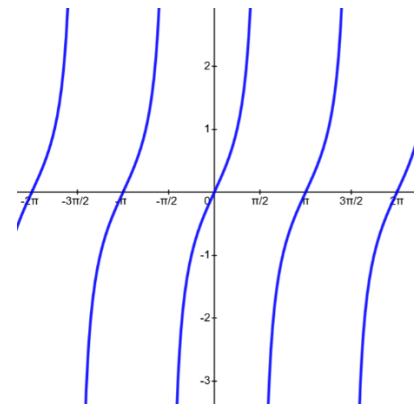$$y = \log(x)$$
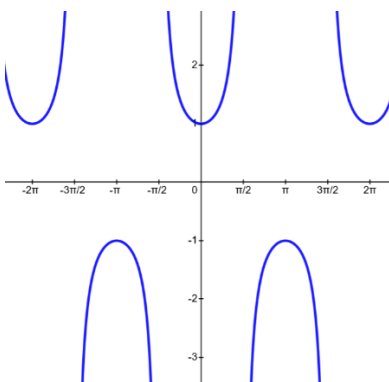
Sine
$$y = \sin(x)$$

Cosine
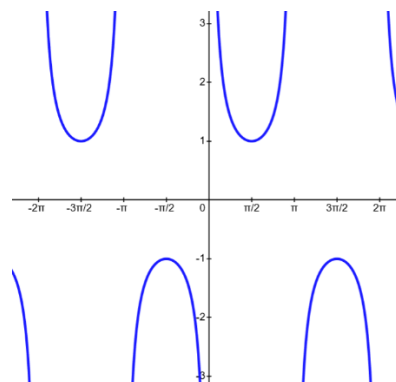$$y = \cos(x)$$

Tangent
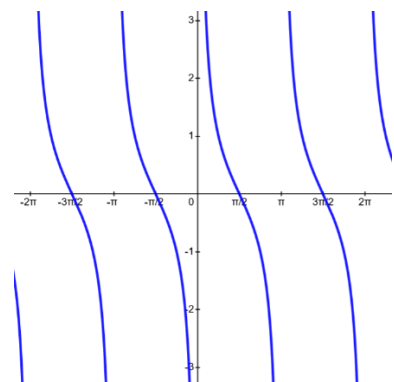$$y = \tan(x)$$
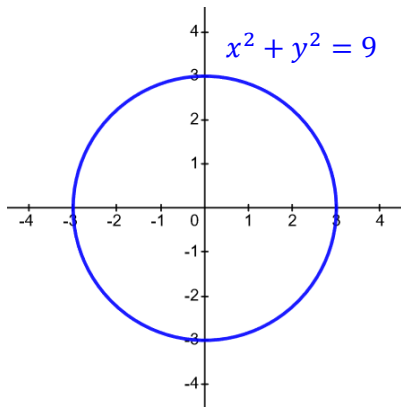
Secant
$$y = \sec(x)$$

Cosecant
$$y = \csc(x)$$

Cotangent
$$y = \cot(x)$$
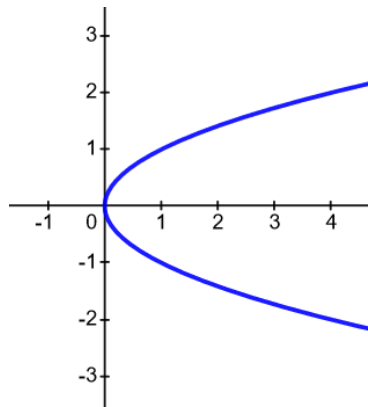
Graphs of Other Common Equations

Circle
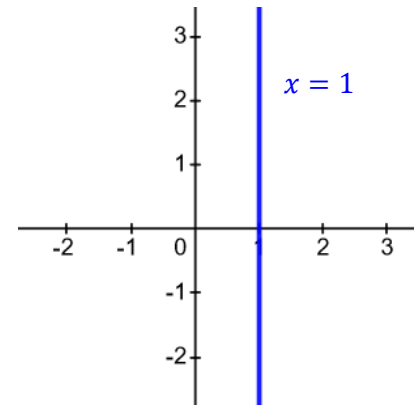$$x^2 + y^2 = r^2$$

$x^2 + y^2 = 9$

Sideways Parabola
$$x = y^2$$

Vertical Line
$$x = c$$

$x = 1$

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

$$\frac{x^2}{16} + \frac{y^2}{4} = 1$$
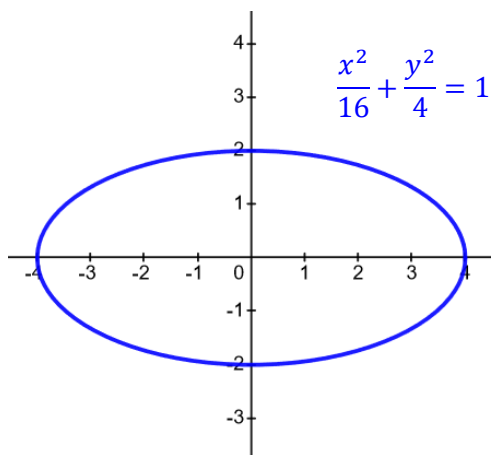
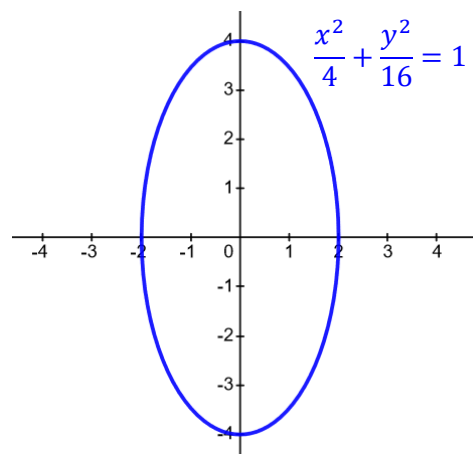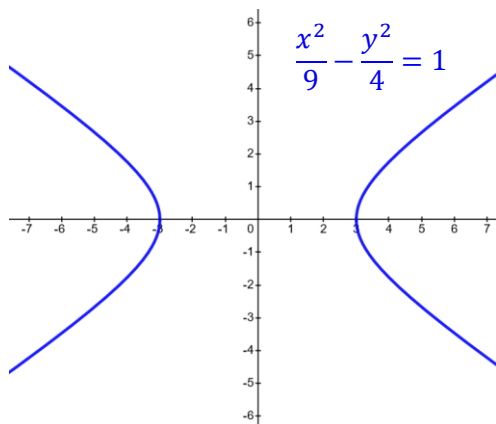### Ellipse
$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$$

$$\frac{x^2}{4} + \frac{y^2}{16} = 1$$

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

$$\frac{x^2}{9} - \frac{y^2}{4} = 1$$

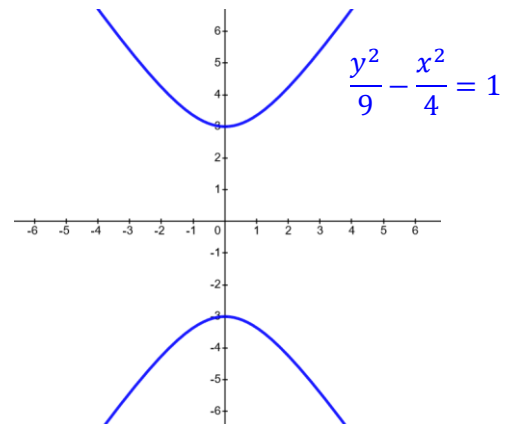### Hyperbola
$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$

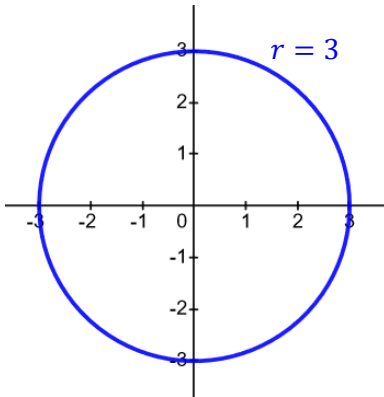$$\frac{y^2}{9} - \frac{x^2}{4} = 1$$

Common Polar Graphs

Circle
$$r = a$$

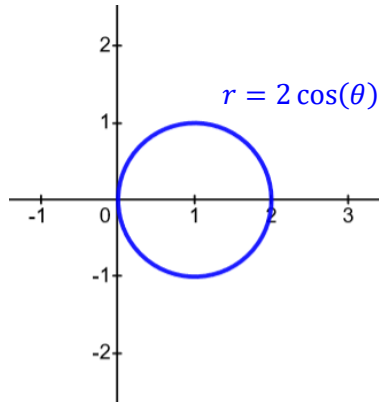$r = 3$

Circle
$$r = a\sin(\theta)$$
$$r = a\cos(\theta)$$
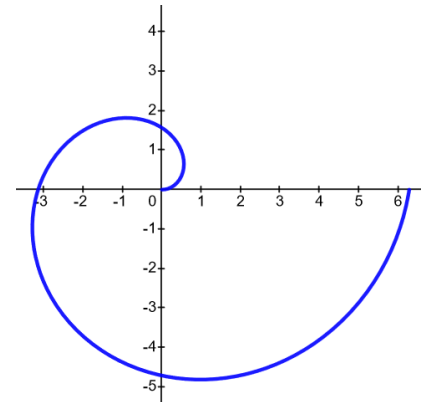
$r = 2\cos(\theta)$

Archimedes' Spiral
$$r = \theta$$
$$\theta \geq 0$$

Inner-Loop Limaçon
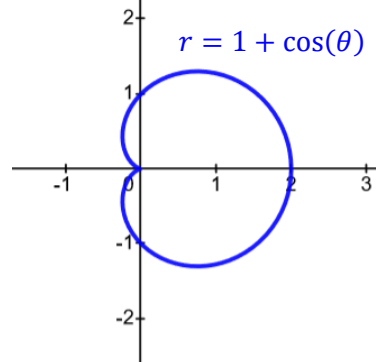$$r = a \pm b\cos(\theta)$$
$$r = a \pm b\sin(\theta)$$
$$a < b$$

$r = 1 + 2\cos(\theta)$
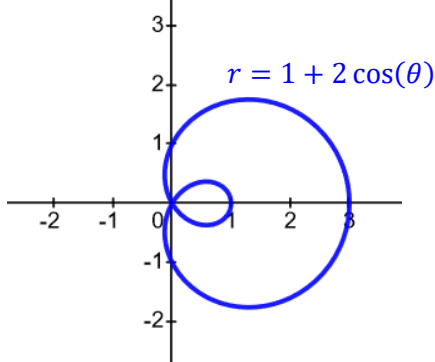
Cardioid
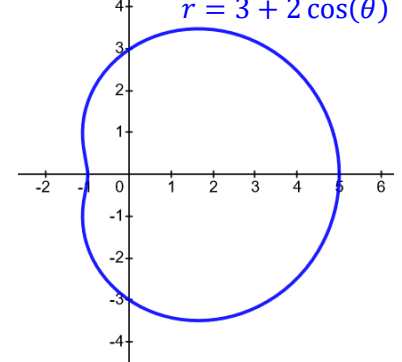$$r = a \pm b\cos(\theta)$$
$$r = a \pm b\sin(\theta)$$
$$a/b = 1$$

$r = 1 + \cos(\theta)$

One-Loop (Dimpled) Limaçon
$$r = a \pm b\cos(\theta)$$
$$r = a \pm b\sin(\theta)$$
$$1 < a/b < 2$$

$r = 3 + 2\cos(\theta)$
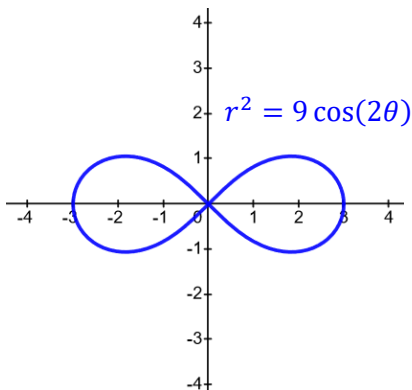
Lemniscate
$$r^2 = a^2 \cos(2\theta)$$
$$r^2 = a^2 \sin(2\theta)$$
$$a \neq 0$$

$r^2 = 9\cos(2\theta)$

Rose Curve (n even)
$$r = a\cos(n\theta)$$
$$r = a\sin(n\theta)$$
n even, $2n$ petals

$r = 3\cos(4\theta)$
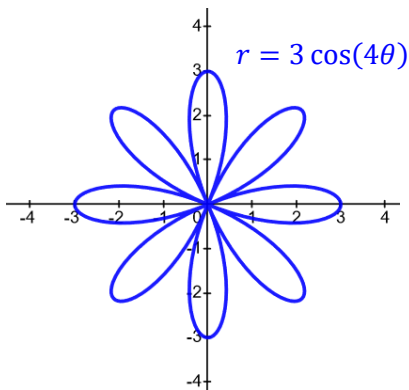
Rose Curve (n odd)
$$r = a\cos(n\theta)$$
$$r = a\sin(n\theta)$$
n odd, n petals

$r = 3\cos(5\theta)$