

## Algebra Resource Sheet

### Arithmetic Operations

$$ab + ac = a(b + c)$$

$$a\left(\frac{b}{c}\right) = \frac{ab}{c}$$

$$\left(\frac{a}{b}\right) \frac{1}{c} = \frac{a}{bc}$$

$$\frac{a}{\left(\frac{b}{c}\right)} = \frac{ac}{b}$$

$$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$$

$$\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$$

$$\frac{a - b}{c - b} = \frac{b - a}{d - c}$$

$$\frac{a + b}{c} = \frac{a}{c} + \frac{b}{c}$$

$$\frac{ab + ac}{a} = b + c, a \neq 0$$

$$\frac{\frac{a}{b}}{\frac{c}{d}} = \frac{ad}{bc}$$

### Properties of Radicals

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

$$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$$

$$\sqrt[m]{\sqrt[n]{a}} = \sqrt{nm}\sqrt{a}$$

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

$$\sqrt[n]{a^n} = a, \text{ if } n \text{ is odd}$$

$$\sqrt[n]{a^n} = a, \text{ if } n \text{ is even}$$

### Important Formulas

Quadratic  
Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Distance  
Formula:

If  $P_1 = (x_1, y_1)$  and  $P_2 = (x_2, y_2)$  are two points, then the distance between them is:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Continuous  
Exponential  
Growth/ Decay

$$P(t) = P_0 e^{rt}$$

### Laws of Exponents

$$a^n a^m = a^{n+m}$$

$$\frac{a^n}{a^m} = a^{n-m} = \frac{1}{a^{m-n}}$$

$$(a^n)^m = a^{nm}$$

$$a^0 = 1, a \neq 0$$

$$(ab)^n = a^n b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$a^{-n} = \frac{1}{a^n}$$

$$\frac{1}{a^{-n}} = a^n$$

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$$

$$\frac{a^n}{a^m} = \left(a^{\frac{1}{m}}\right)^n = (a^n)^{\frac{1}{m}}$$

### Logarithms and Log Properties

*Definition*

$$y = \log_b x \text{ is equivalent to } x = b^y$$

*Logarithm Properties*

$$\log_b b = 1$$

$$\log_b 1 = 0$$

$$\log_b b^x = x$$

$$b^{\log_b x} = x$$

$$\log_b (x^r) = r \log_b x$$

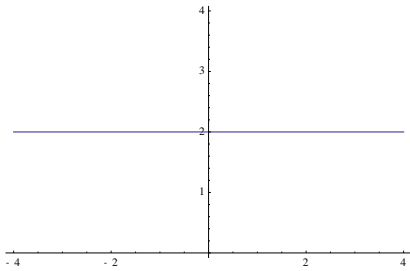
$$\log_b (xy) = \log_b x + \log_b y$$

$$\log_b \left(\frac{x}{y}\right) = \log_b x - \log_b y$$

# Functions and Graphs

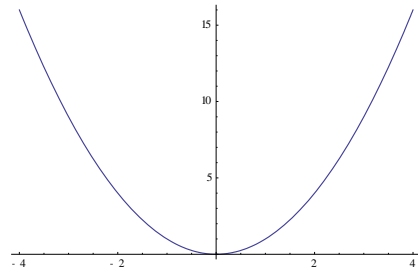
## Constant Function:

$$f(x) = a, \text{ where } a \text{ is a constant}$$



## Parabola/Quadratic Function:

$$f(x) = ax^2 + bx + c$$



## Line/Linear Function:

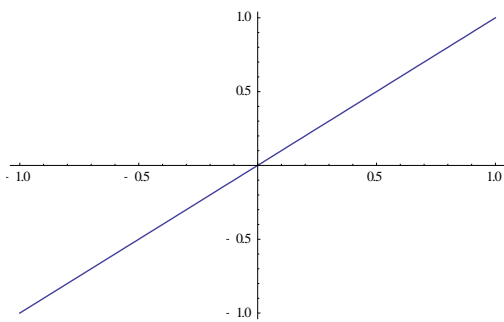
$$f(x) = mx + b$$

Slope-intercept form:

$$y = mx + b$$

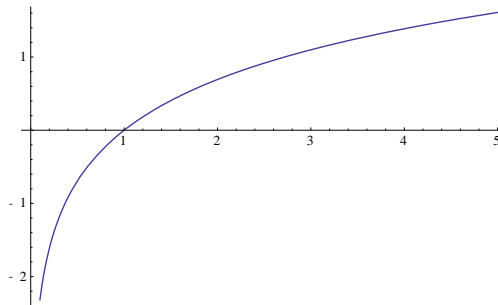
Point-slope form:

$$y - y_1 = m(x - x_1)$$



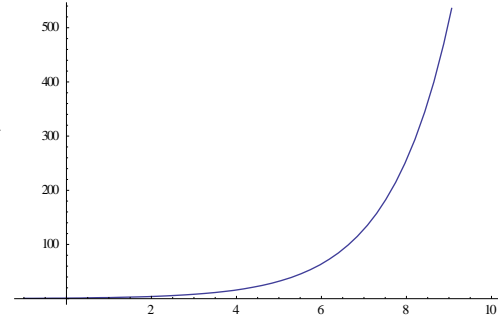
## Logarithmic Function:

$$f(x) = \log_b x$$



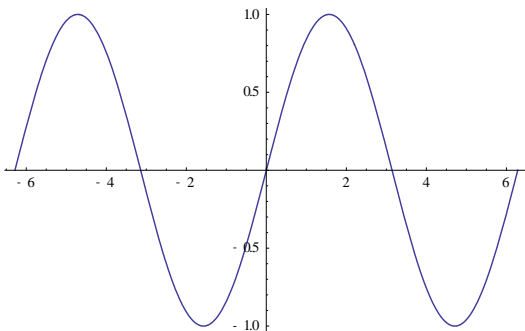
## Exponential Function:

$$f(x) = ab^x$$



## Sine Function:

$$f(x) = \sin(x)$$



## Cosine function:

$$f(x) = \cos(x)$$

