

Double Angle Identities

$$33. \sin\left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 - \cos \theta}{2}} \quad \sin^2 \theta = \frac{1 - \cos 2\theta}{2}$$

$$34. \cos\left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 + \cos \theta}{2}} \quad \cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

$$35. \tan\left(\frac{\theta}{2}\right) = \pm \sqrt{\frac{1 - \cos \theta}{1 + \cos \theta}} \quad \tan\left(\frac{\theta}{2}\right) = \frac{1 - \cos \theta}{\sin \theta} = \frac{\sin \theta}{1 + \cos \theta}$$

Half-Angle Identities

$$\sin\left(\frac{a}{2}\right) = \pm \sqrt{\frac{1 - \cos a}{2}}$$

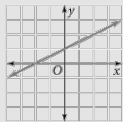
$$\cos\left(\frac{a}{2}\right) = \pm \sqrt{\frac{1 + \cos a}{2}}$$

$$\tan\left(\frac{a}{2}\right) = \frac{1 - \cos a}{\sin a} = \frac{\sin a}{1 + \cos a}$$

Families of Function

Linear function

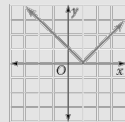
$$y = mx + b$$



slope = m
y-intercept = b
The greatest exponent is 1.

Absolute value function

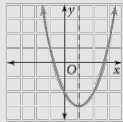
$$y = |x - a| + b$$



shift $y = |x|$ horizontally a units
shift $y = |x|$ vertically b units
vertex at (a, b)
The greatest exponent is 1.

Quadratic function

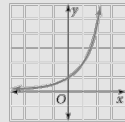
$$y = ax^2 + bx + c$$



parabola with axis of symmetry at $x = -\frac{b}{2a}$
The greatest exponent is 2.

Exponential function

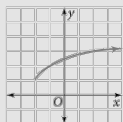
$$y = ab^x$$



growth for $b > 1$
decay for $0 < b < 1$
The variable is the exponent.

Radical function

$$y = \sqrt{x - b} + c$$



shift $y = \sqrt{x}$ horizontally b units
shift $y = \sqrt{x}$ vertically c units
The variable is under the radical.

Rational function

$$y = \frac{a}{x - b} + c$$



vertical asymptote at $x = b$
horizontal asymptote at $y = c$
The variable is in the denominator.

Identities

A. Reciprocal	B. Ratio	C. Pythagorean
$\csc = \frac{1}{\sin}$	$\tan = \frac{\sin}{\cos}$	$\sin^2 + \cos^2 = 1$
$\sin \csc = 1$	$\cot = \frac{\cos}{\sin}$	$\tan^2 + 1 = \sec^2$
$\sec = \frac{1}{\cos}$	$\cos = \frac{\sin}{\tan}$	$1 + \cot^2 = \csc^2$
$\cos \sec = 1$	$\sin = \frac{\cos}{\cot}$	$1 - \cos^2 = \sin^2$
$\cot = \frac{1}{\tan}$	$\sin = \cos \tan$	$1 - \sin^2 = \cos^2$
$\tan \cot = 1$	$\cos = \sin \cot$	$\sec^2 - \tan^2 = 1$
$\sin = \frac{1}{\csc}$		$\csc^2 - 1 = \cot^2$
$\cos = \frac{1}{\sec}$		$\sec^2 \cdot \cot^2 = 1$
$\tan = \frac{1}{\cot}$		

Parent Functions

constant function

$f(x) = a$ graph is a horizontal line

identity function

$f(x) = x$ points on graph have coordinates (a, a)

quadratic function

$f(x) = x^2$ graph is U-shaped

cubic function

$f(x) = x^3$ graph is symmetric about the origin

square root function

$f(x) = \sqrt{x}$ graph is in first quadrant

reciprocal function

$f(x) = 1/x$ graph has two branches

absolute value function

$f(x) = |x|$ graph is V-shaped

Exponential & Logarithmic

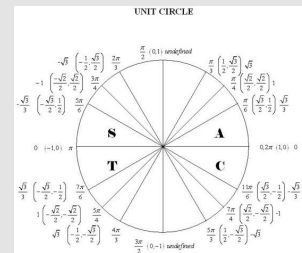
Logarithmic

$$y = \ln x$$

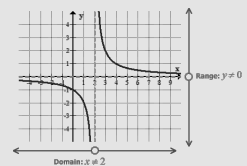
Exponential

$$y = b^x$$

Unit Circle



Domain & Range



Domain: The domain of a function is the set of all possible input values (often the "x" variable), which produce a valid output from a particular function. It is the set of all real numbers for which a function is mathematically defined.

Range: The range is the set of all possible output values (usually the variable y, or sometimes expressed as $f(x)$), which result from using a particular function.