Trigonometry

Reciprocal Identities

$\sin\theta = \frac{1}{\csc\theta}$ $\csc\theta = \frac{1}{\sin\theta}$

$\cos\theta = \frac{1}{\sec\theta}$ $\sec\theta = \frac{1}{\cos\theta}$

$\tan\theta = \frac{1}{\cot\theta}$ $\cot\theta = \frac{1}{\tan\theta}$

Quotient Identities

$\frac{\sin\theta}{\cos\theta} = \tan\theta$

$\frac{\cos\theta}{\sin\theta} = \cot\theta$

Pythagorean Identities

$\sin^2\theta + \cos^2\theta = 1$

$\tan^2\theta + 1 = \sec^2\theta$

$1 + \cot^2\theta = \csc^2\theta$

Cofunction Identities

$\sin\theta = \cos(90° - \theta)$ $\cos\theta = \sin(90° - \theta)$

$\tan\theta = \cot(90° - \theta)$ $\cot\theta = \tan(90° - \theta)$

$\sec\theta = \csc(90° - \theta)$ $\csc\theta = \sec(90° - \theta)$

Opposite Angle Identities

$\sin(-A) = -\sin A$

$\cos(-A) = \cos(A)$

$\tan(-A) = -\tan(A)$

Sum and Difference Identities

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$

$\tan(\alpha \pm \beta) = \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$

Double-Angle Identities

$\sin 2\theta = 2\sin\theta\cos\theta$

$\cos 2\theta = \cos^2\theta - \sin^2\theta$

$\cos 2\theta = 2\cos^2\theta - 1$

$\cos 2\theta = 1 - 2\sin^2\theta$

$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$

Half-Angle Identities

$\sin\frac{\alpha}{2} = \pm\sqrt{\frac{1 - \cos\alpha}{2}}$

$\cos\frac{\alpha}{2} = \pm\sqrt{\frac{1 + \cos\alpha}{2}}$

$\tan\frac{\alpha}{2} = \pm\sqrt{\frac{1 - \cos\alpha}{1 + \cos\alpha}}, \cos\alpha \neq -1$

Product-Sum Identities

$\sin\alpha\cos\beta = \frac{1}{2}[\sin(\alpha + \beta) + \sin(\alpha - \beta)]$

$\cos\alpha\sin\beta = \frac{1}{2}[\sin(\alpha + \beta) - \sin(\alpha - \beta)]$

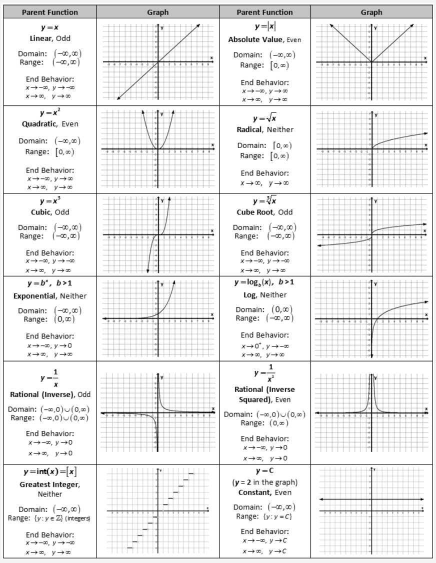
$\sin\alpha\sin\beta = \frac{1}{2}[\cos(\alpha - \beta) - \cos(\alpha + \beta)]$

$\cos\alpha\cos\beta = \frac{1}{2}[\cos(\alpha + \beta) + \cos(\alpha - \beta)]$

Interval Notation

	Interval notation	Set Notation
	D: $[1, +\infty)$	D: $\{x \mid x \geq 1\}$
All quadratic functions (e.g. $y = x^2$) have their domain defined as:	D: $[-\infty, +\infty)$	D: $\{x \mid x \text{ all Real numbers}\}$
A quadratic function that opens downward with the vertex at (0,3):	R: $[-\infty, 3)$	R: $\{y \mid y \leq 3\}$
For a quadratic function that opens upward with a vertex at (0,2):	R: $[2, +\infty)$	R: $\{x \mid x \geq 2\}$

Parent Functions



Parent Function	Graph	Parent Function	Graph
$y = x$ **Linear**, Odd; Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$; End Behavior: $x \to -\infty, y \to -\infty$; $x \to \infty, y \to \infty$		$y = \lvert x \rvert$ **Absolute Value**, Even; Domain: $(-\infty, \infty)$ Range: $[0, \infty)$; End Behavior: $x \to -\infty, y \to \infty$; $x \to \infty, y \to \infty$	
$y = x^2$ **Quadratic**, Even; Domain: $(-\infty, \infty)$ Range: $[0, \infty)$; End Behavior: $x \to -\infty, y \to \infty$; $x \to \infty, y \to \infty$		$y = \sqrt{x}$ **Radical**, Neither; Domain: $[0, \infty)$ Range: $[0, \infty)$; End Behavior: $x \to \infty, y \to \infty$	
$y = x^3$ **Cubic**, Odd; Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$; End Behavior: $x \to -\infty, y \to -\infty$; $x \to \infty, y \to \infty$		$y = \sqrt[3]{x}$ **Cube Root**, Odd; Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$; End Behavior: $x \to -\infty, y \to -\infty$; $x \to \infty, y \to \infty$	
$y = b^x$, $b > 1$ **Exponential**, Neither; Domain: $(-\infty, \infty)$ Range: $(0, \infty)$; End Behavior: $x \to -\infty, y \to 0$; $x \to \infty, y \to \infty$		$y = \log_b(x)$, $b > 1$ **Log**, Neither; Domain: $(0, \infty)$ Range: $(-\infty, \infty)$; End Behavior: $x \to 0^+, y \to -\infty$; $x \to \infty, y \to \infty$	
$y = \frac{1}{x}$ **Rational (Inverse)**, Odd; Domain: $(-\infty, 0) \cup (0, \infty)$ Range: $(-\infty, 0) \cup (0, \infty)$; End Behavior: $x \to -\infty, y \to 0$; $x \to \infty, y \to 0$		$y = \frac{1}{x^2}$ **Rational (Inverse Squared)**, Even; Domain: $(-\infty, 0) \cup (0, \infty)$ Range: $(0, \infty)$; End Behavior: $x \to -\infty, y \to 0$; $x \to \infty, y \to 0$	
$y = \text{int}(x) = [x]$ **Greatest Integer**, Neither; Domain: $(-\infty, \infty)$ Range: $\{y : y \in \mathbb{Z}\}$ (integers); End Behavior: $x \to -\infty, y \to -\infty$; $x \to \infty, y \to \infty$		$y = C$ (y = 2 in the graph) **Constant**, Even; Domain: $(-\infty, \infty)$ Range: $\{y : y = C\}$; End Behavior: $x \to -\infty, y \to C$; $x \to \infty, y \to C$	

Domain and 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.

Exponentials and logarithms

Logarithmic

y = ln x

Exponential

y=b^x

Unit Circle