



Basic Trigonometric Functions

Right Triangle Definitions

Sine ($\sin \theta$)	opposite / hypotenuse
Cosine ($\cos \theta$)	adjacent / hypotenuse
Tangent ($\tan \theta$)	opposite / adjacent
Cosecant ($\csc \theta$)	hypotenuse / opposite ($1 / \sin \theta$)
Secant ($\sec \theta$)	hypotenuse / adjacent ($1 / \cos \theta$)
Cotangent ($\cot \theta$)	adjacent / opposite ($1 / \tan \theta$)

Reciprocal Identities

$\sin \theta$	$1 / \csc \theta$
$\cos \theta$	$1 / \sec \theta$
$\tan \theta$	$1 / \cot \theta$
$\csc \theta$	$1 / \sin \theta$
$\sec \theta$	$1 / \cos \theta$
$\cot \theta$	$1 / \tan \theta$

Quotient Identities

$\tan \theta$	$\sin \theta / \cos \theta$
$\cot \theta$	$\cos \theta / \sin \theta$

Trigonometric Identities

Pythagorean Identities

$\sin^2 \theta + \cos^2 \theta = 1$
$1 + \tan^2 \theta = \sec^2 \theta$
$1 + \cot^2 \theta = \csc^2 \theta$

Angle Sum and Difference Identities

$\sin(A + B)$	$\sin A \cos B + \cos A \sin B$
$\sin(A - B)$	$\sin A \cos B - \cos A \sin B$
$\cos(A + B)$	$\cos A \cos B - \sin A \sin B$
$\cos(A - B)$	$\cos A \cos B + \sin A \sin B$
$\tan(A + B)$	$(\tan A + \tan B) / (1 - \tan A \tan B)$
$\tan(A - B)$	$(\tan A - \tan B) / (1 + \tan A \tan B)$

Double Angle Identities

$\sin(2\theta)$	$2 \sin \theta \cos \theta$
$\cos(2\theta)$	$\cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$
$\tan(2\theta)$	$2 \tan \theta / (1 - \tan^2 \theta)$

Half Angle Identities

$\sin(\theta/2)$	$\pm \sqrt{((1 - \cos \theta) / 2)}$
$\cos(\theta/2)$	$\pm \sqrt{((1 + \cos \theta) / 2)}$
$\tan(\theta/2)$	$\sin \theta / (1 + \cos \theta) = (1 - \cos \theta) / \sin \theta$

Unit Circle

Common Angles

0° (0 radians)	(1, 0)
30° ($\pi/6$ radians)	($\sqrt{3}/2, 1/2$)
45° ($\pi/4$ radians)	($\sqrt{2}/2, \sqrt{2}/2$)
60° ($\pi/3$ radians)	($1/2, \sqrt{3}/2$)
90° ($\pi/2$ radians)	(0, 1)
180° (π radians)	(-1, 0)
270° ($3\pi/2$ radians)	(0, -1)

Sine and Cosine Values

$\sin \theta$	y-coordinate
$\cos \theta$	x-coordinate

Tangent Values

$\tan \theta = \sin \theta / \cos \theta = y / x$

Laws and Formulas

Law of Sines

$a / \sin A = b / \sin B = c / \sin C$
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Law of Cosines

$a^2 = b^2 + c^2 - 2bc \cos A$
$b^2 = a^2 + c^2 - 2ac \cos B$
$c^2 = a^2 + b^2 - 2ab \cos C$

Area of a Triangle

Area (using sides and angle)	$1/2 * ab * \sin C = 1/2 * bc * \sin A = 1/2 * ac * \sin B$
Heron's Formula (using sides)	$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$, where $s = (a + b + c) / 2$