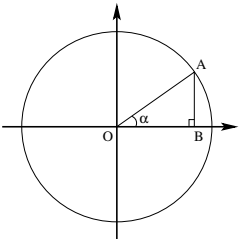


Trigonometry Basics



sin alpha = AB/OA, cos alpha = OB/OA, tan alpha = AB/OB, cot alpha = OB/AB, sec alpha = OA/OB, csc alpha = OA/AB

Trigonometry Basic Formulas

sin^2 alpha + cos^2 alpha = 1, tan alpha = 1/cot alpha, tan alpha = sin alpha/cos alpha, cot alpha = cos alpha/sin alpha, sec alpha = 1/cos alpha, csc alpha = 1/sin alpha, 1 + tan^2 alpha = 1/cos^2 alpha = sec^2 alpha, 1 + cot^2 alpha = 1/sin^2 alpha = csc^2 alpha

Popular Angles

	0	pi/6 (30°)	pi/4 (45°)	pi/3 (60°)	pi/2 (90°)
sin	0	1/2	sqrt(2)/2	sqrt(3)/2	1
cos	1	sqrt(3)/2	sqrt(2)/2	1/2	0
tan	0	sqrt(3)/3	1	sqrt(3)	±∞
cot	+∞	sqrt(3)	1	sqrt(3)/3	0
sec	1	2sqrt(3)/3	sqrt(2)	2	±∞
csc	+∞	2	sqrt(2)	2sqrt(3)/3	1

Double-Angle

sin 2alpha = 2 sin alpha cos alpha, cos 2alpha = cos^2 alpha - sin^2 alpha, cos 2alpha = 1 - 2 sin^2 alpha, cos 2alpha = 2 cos^2 alpha - 1, tan 2alpha = 2 tan alpha / (1 - tan^2 alpha), cot 2alpha = (cot^2 alpha - 1) / (2 cot alpha), sin 2alpha = 2 tan alpha / (1 + tan^2 alpha), cos 2alpha = (1 - tan^2 alpha) / (1 + tan^2 alpha), tan alpha + cot alpha = 2 / sin 2alpha, cot alpha - tan alpha = 2 / tan 2alpha, 1 - tan^2 alpha = cos 2alpha / cos^2 alpha, 1 - cot^2 alpha = -cos 2alpha / sin^2 alpha, sin 3alpha = 3 sin alpha - 4 sin^3 alpha, cos 3alpha = 4 cos^3 alpha - 3 cos alpha

Half-Angle

sin alpha/2 = sqrt((1 - cos alpha)/2), cos alpha/2 = sqrt((1 + cos alpha)/2), sin alpha = 2 tan(alpha/2) / (1 + tan^2(alpha/2)), cos alpha = (1 - tan^2(alpha/2)) / (1 + tan^2(alpha/2)), tan alpha/2 = sqrt((1 - cos alpha)/(1 + cos alpha)), tan alpha = 2 tan(alpha/2) / (1 - tan^2(alpha/2)), tan alpha/2 = sin alpha / (1 + cos alpha) = (1 - cos alpha) / sin alpha, cot alpha/2 = sqrt((1 + cos alpha)/(1 - cos alpha)) = (1 + cos alpha) / sin alpha = sin alpha / (1 - cos alpha), tan alpha tan alpha/2 = sec alpha - 1 = (1 - cos alpha) / cos alpha, 1 + sin alpha = 2 cos^2(pi/4 - alpha/2), 1 + cos alpha = 2 cos^2(alpha/2), 1 - sin alpha = 2 sin^2(pi/4 - alpha/2), 1 - cos alpha = 2 sin^2(alpha/2), 1 + tan alpha = sqrt(2) * sin(pi/4 + alpha) / cos alpha, 1 - tan alpha = sqrt(2) * sin(pi/4 - alpha) / cos alpha

Sums of Angles

sin(alpha ± beta) = sin alpha cos beta ± cos alpha sin beta, cos(alpha ± beta) = cos alpha cos beta ∓ sin alpha sin beta, tan(alpha ± beta) = (tan alpha ± tan beta) / (1 ∓ tan alpha tan beta), cot(alpha ± beta) = (cot alpha cot beta ∓ 1) / (cot alpha ± cot beta), sin(alpha + beta) sin(alpha - beta) = sin^2 alpha - sin^2 beta, cos(alpha + beta) cos(alpha - beta) = cos^2 alpha - sin^2 beta

Phase Shift

	-alpha	pi/2 - alpha	pi/2 + alpha	pi - alpha	pi + alpha	3pi/2 - alpha	3pi/2 + alpha	2pi - alpha
sin	-sin alpha	cos alpha	cos alpha	sin alpha	-sin alpha	-cos alpha	-cos alpha	-sin alpha
cos	cos alpha	sin alpha	-sin alpha	-cos alpha	-cos alpha	-sin alpha	sin alpha	cos alpha
tan	-tan alpha	cot alpha	-cot alpha	-tan alpha	tan alpha	cot alpha	-cot alpha	-tan alpha
cot	-cot alpha	tan alpha	-tan alpha	-cot alpha	cot alpha	tan alpha	-tan alpha	-cot alpha
	cos(alpha + pi n) = (-1)^n cos alpha							
	sin(alpha + pi n) = (-1)^n sin alpha							

Sine/Cosine Theorem

BC/sin BAC = AC/sin ABC = AB/sin ACB = 2R, sin(BAC/2) = sqrt((P-AC)(P-AB)/(AB*AC)), P = (AB+AC+BC)/2, cos(BAC/2) = sqrt(P(P-BC)/(AB*AC)), BC^2 = AC^2 + AB^2 - 2 AC AB cos BAC

S_ABC = 1/2 BC AC sin ACB = 2R^2 sin BAC sin ABC sin ACB = sqrt(P(P-BC)(P-AC)(P-AB)) / 4R = Pr, m_BC = sqrt(BC^2/4 + AB^2 - BC AB cos ABC) = 1/2 sqrt(2AB^2 + 2AC^2 - BC^2), beta_BC = (sin ABC / sin(BAC/2)) * (AB BC / (AC + AB)) = sqrt(AC AB - DB DC)