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Inverse trigonometric functions and their properties

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Principal ranges	sin^-1: [-pi/2, pi/2]; cos^-1: [0, pi]; tan^-1: (-pi/2, pi/2); cot^-1: (0, pi) Valid when: principal values, angles in radians	radians
Domains	sin^-1 and cos^-1: [-1, 1]; tan^-1 and cot^-1: all real numbers; sec^-1 and cosec^-1: |x| >= 1 Valid when: each inverse function is defined only on its stated domain	x dimensionless
Composition	sin(sin^-1 x) = x for |x| <= 1; sin^-1(sin x) = x only for x in [-pi/2, pi/2]; cos^-1(cos x) = x only for x in [0, pi] Valid when: sin(sin^-1 x)=x needs |x|<=1; sin^-1(sin x)=x needs x in [-pi/2, pi/2]	radians
Negative argument	sin^-1(-x) = -sin^-1 x; tan^-1(-x) = -tan^-1 x; cos^-1(-x) = pi - cos^-1 x Valid when: x in the domain; the cos^-1 rule holds for |x| <= 1	radians
Complementary pairs	sin^-1 x + cos^-1 x = pi/2 (|x| <= 1); tan^-1 x + cot^-1 x = pi/2 (all x) Valid when: |x| <= 1 for the sin/cos pair; all real x for the tan/cot pair	radians
Sum of inverse tangents	tan^-1 x + tan^-1 y = tan^-1((x + y)/(1 - x y)) for x y < 1; + pi if x y > 1, x, y > 0; - pi if x y > 1, x, y < 0 Valid when: x y < 1 for the plain form; add or subtract pi as stated when x y > 1	radians
Doubling forms	2 tan^-1 x = sin^-1(2x/(1 + x^2)) for |x| <= 1; = cos^-1((1 - x^2)/(1 + x^2)) for x >= 0; = tan^-1(2x/(1 - x^2)) for |x| < 1 Valid when: each form needs its stated range of x; outside it use pi minus the angle	radians
Triangle conversions	sin(cos^-1 x) = sqrt(1 - x^2); cos(sin^-1 x) = sqrt(1 - x^2); tan(sin^-1 x) = x/sqrt(1 - x^2) Valid when: |x| <= 1 (x not +/-1 for the tan form); principal values, so cosine is non-negative	dimensionless; |x| < 1 for the tangent

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/trigonometry/inverse-trigonometric-functions-and-their-properties

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