Fundamental Trigonometric Identities

Reciprocal Identities

R1: $\csc(x) = \dfrac{1}{\sin(x)}$ R2: $\sec(x) = \dfrac{1}{\cos(x)}$ R3: $\cot(x) = \dfrac{1}{\tan(x)}$

R4: $\sin(x) = \dfrac{1}{\csc(x)}$ R5: $\cos(x) = \dfrac{1}{\sec(x)}$ R6: $\tan(x) = \dfrac{1}{\cot(x)}$

Quotient Identities

Q1: $\tan(x) = \dfrac{\sin(x)}{\cos(x)}$ Q2: $\cot(x) = \dfrac{\cos(x)}{\sin(x)}$

Pythagorean Identities

P1: $\sin^2 x + \cos^2 x = 1$ P2: $1 + \tan^2 x = \sec^2 x$ P3: $1 + \cot^2 x = \csc^2 x$

Even-Odd Identities

C1: $\sin(-x) = -\sin x$ C2: $\cos(-x) = \cos x$ C3: $\tan(-x) = -\tan x$

C4: $\csc(-x) = -\csc x$ C5: $\sec(-x) = \sec x$ C6: $\cot(-x) = -\cot x$

Cofunction Identities

CF1: $\sin\left(\dfrac{\pi}{2} - x\right) = \cos x$ CF2: $\cos\left(\dfrac{\pi}{2} - x\right) = \sin x$

CF3: $\tan\left(\dfrac{\pi}{2} - x\right) = \cot x$ CF4: $\cot\left(\dfrac{\pi}{2} - x\right) = \tan x$

CF5: $\sec\left(\dfrac{\pi}{2} - x\right) = \csc x$ CF6: $\csc\left(\dfrac{\pi}{2} - x\right) = \sec x$

Addition and Subtraction Identities

A1: $\sin(A + B) = \sin A \cdot \cos B + \sin B \cdot \cos A$ S1: $\sin(A - B) = \sin A \cdot \cos B - \sin B \cdot \cos A$

A2: $\cos(A + B) = \cos A \cdot \cos B - \sin A \cdot \sin B$ S2: $\cos(A - B) = \cos A \cdot \cos B + \sin A \cdot \sin B$

A3: $\tan(A + B) = \dfrac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$ S3: $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$

Double Angle Identities

D1: $\sin(2\theta) = 2\sin\theta \cdot \cos\theta$

D2a: $\cos(2\theta) = \cos^2\theta - \sin^2\theta$

D2b: $\cos(2\theta) = 1 - 2\sin^2\theta$

D2c: $\cos(2\theta) = 2\cos^2\theta - 1$

D3: $\tan(2\theta) = \dfrac{2\tan\theta}{1-\tan^2\theta}$

Half-Angle Identities

H1: $\sin\left(\dfrac{A}{2}\right) = \pm\sqrt{\dfrac{1-\cos A}{2}}$ H2: $\cos\left(\dfrac{A}{2}\right) = \pm\sqrt{\dfrac{1+\cos A}{2}}$

H3a: $\tan\left(\dfrac{A}{2}\right) = \pm\sqrt{\dfrac{1-\cos A}{1+\cos A}}$ H3b: $\tan\left(\dfrac{A}{2}\right) = \dfrac{1-\cos A}{\sin A}$

H3c: $\tan\left(\dfrac{A}{2}\right) = \dfrac{\sin A}{1+\cos A}$

OR: $\sin^2 A = \dfrac{1}{2}(1-\cos 2A)$ **OR:** $\cos^2 A = \dfrac{1}{2}(1+\cos 2A)$