

Trigonometry Lecture Summary



The provided images contain detailed lecture notes on Trigonometric Ratios and Identities. Here's a structured summary of the content:

Trigonometric Ratios and Identities

1. T-Ratios of Various Angles and Their Signs in Four Quadrants

- **Basic Identities:**

- $\sec \theta = \frac{1}{\cos \theta}$
- $\csc \theta = \frac{1}{\sin \theta}$
- $\cot \theta = \frac{1}{\tan \theta}$
- $\cos^2 \theta + \sin^2 \theta = 1$
- $1 + \tan^2 \theta = \sec^2 \theta$
- $1 + \cot^2 \theta = \csc^2 \theta$

- **Signs of T-Ratios in Quadrants:**

- **I Quadrant:** All are positive
- **II Quadrant:** Only $\sin \theta$ and $\csc \theta$ are positive
- **III Quadrant:** Only $\tan \theta$ and $\cot \theta$ are positive
- **IV Quadrant:** Only $\cos \theta$ and $\sec \theta$ are positive

2. Values of T-Functions at Specific Angles

Angle	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined	0	Not defined	0

3. Range of T-Ratios

- $-1 \leq \sin \theta \leq 1$
- $-1 \leq \cos \theta \leq 1$
- $|\csc \theta| \geq 1$
- $|\sec \theta| \geq 1$
- $-\infty < \tan \theta < \infty$
- $-\infty < \cot \theta < \infty$

4. Period of T-Ratios

- All T-ratios are periodic functions.
- Period of $\tan \theta$ and $\cot \theta$ is π .

- Period of $\sin \theta$, $\cos \theta$, $\csc \theta$, and $\sec \theta$ is 2π .

5. Sum and Difference Formulas

- **Cosine:**
 - $\cos(x + y) = \cos x \cos y - \sin x \sin y$
 - $\cos(x - y) = \cos x \cos y + \sin x \sin y$
- **Sine:**
 - $\sin(x + y) = \sin x \cos y + \cos x \sin y$
 - $\sin(x - y) = \sin x \cos y - \cos x \sin y$
- **Tangent:**
 - $\tan(x + y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$
 - $\tan(x - y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$
- **Cotangent:**
 - $\cot(x + y) = \frac{\cot x \cot y - 1}{\cot y + \cot x}$
 - $\cot(x - y) = \frac{\cot x \cot y + 1}{\cot y - \cot x}$

6. Double Angle Formulas

- **Sine:**
 - $\sin 2x = 2 \sin x \cos x$
- **Cosine:**
 - $\cos 2x = \cos^2 x - \sin^2 x$
 - $\cos 2x = 2 \cos^2 x - 1$
 - $\cos 2x = 1 - 2 \sin^2 x$
- **Tangent:**
 - $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$

7. Product to Sum Formulas

- $2 \sin x \cos y = \sin(x + y) + \sin(x - y)$
- $2 \cos x \cos y = \cos(x + y) + \cos(x - y)$
- $2 \sin x \sin y = \cos(x - y) - \cos(x + y)$

8. Sum to Product Formulas

- $\sin x + \sin y = 2 \sin \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right)$
- $\sin x - \sin y = 2 \cos \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right)$
- $\cos x + \cos y = 2 \cos \left(\frac{x+y}{2} \right) \cos \left(\frac{x-y}{2} \right)$
- $\cos x - \cos y = -2 \sin \left(\frac{x+y}{2} \right) \sin \left(\frac{x-y}{2} \right)$