

## Trig Identities

Name: \_\_\_\_\_ Period: \_\_\_\_\_

Verify each identity.

1.  $\sin x \sec x = \tan x$

$$\sin x \cdot \frac{1}{\cos x} = \tan x$$

$$\frac{\sin x}{\cos x} = \tan x$$

$$\tan x = \tan x \quad \checkmark$$

2.  $\cos x \csc x = \cot x$

$$= \cos x \cdot \frac{1}{\sin x}$$

$$= \frac{\cos x}{\sin x}$$

$$= \cot x = \cot x \quad \checkmark$$

3.  $\tan x \cos x = \sin x$

$$\frac{\sin x}{\cos x} \cdot \cos x$$

$$\sin x = \sin x \quad \checkmark$$

4.  $\cot x \sin x = \cos x$

$$\frac{\cos x}{\sin x} \cdot \sin x$$

$$\cos x = \cos x \quad \checkmark$$

5.  $\sin x \tan x \cos x = \sin^2 x$

$$\sin x \cdot \frac{\sin x}{\cos x} \cdot \cos x = \sin^2 x$$

$$\sin x \cdot \sin x = \sin^2 x$$

$$\sin^2 x = \sin^2 x \quad \checkmark$$

6.  $\sin x \cot x \cos x = \cos^2 x$

$$= \sin x \cdot \frac{\cos x}{\sin x} \cdot \cos x$$

$$= \cos x \cdot \cos x$$

$$\cos^2 x = \cos^2 x \quad \checkmark$$

7.  $\sec x - \sec x \sin^2 x = \cos x$

$$\sec x (1 - \sin^2 x)$$

$$\sec x (\cos^2 x)$$

$$\frac{1}{\cos x} \cdot \cos^2 x$$

$$\cos x = \cos x \quad \checkmark$$

8.  $\csc x - \csc x \cos^2 x = \sin x$

$$= \csc x (1 - \cos^2 x)$$

$$= \frac{1}{\sin x} \cdot \sin^2 x$$

$$\sin x = \sin x$$

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$$\begin{aligned} \cos^2 x - \sin^2 x &= 1 - 2 \sin^2 x \\ &= (1 - \sin^2 x) - \sin^2 x \\ &= 1 - 2 \sin^2 x = 1 - 2 \sin^2 x \quad \checkmark \end{aligned}$$

$$\begin{aligned} 13. \quad \sin t \tan t &= \frac{1 - \cos^2 t}{\cos t} \\ &= \frac{\sin^2 t}{\cos t} \\ &= \frac{\sin t}{\cos t} \cdot \sin t \\ \sin t \cdot \tan t &= \tan t \cdot \sin t \end{aligned}$$

10.  $\csc \theta - \sin \theta = \cot \theta \cos \theta$

$$\begin{aligned} &= \frac{\cos \theta}{\sin \theta} \cdot \cos \theta \\ &= \frac{\cos^2 \theta}{\sin \theta} \\ &= \frac{1 - \sin^2 \theta}{\sin \theta} = \frac{1}{\sin \theta} - \frac{\sin^2 \theta}{\sin \theta} \\ &= \csc \theta - \sin \theta \quad \checkmark \end{aligned}$$

$$\begin{aligned} 14. \quad \frac{\csc^2 t}{\cot t} &= \csc t \sec t \\ \frac{\cot^2 t + 1}{\cot t} &\rightarrow \frac{\cos^2 t + \sin^2 t}{\sin t \cdot \cos t} \\ \frac{\cot^2 t + 1}{\cot t \cdot \cot t} &= \frac{1}{\sin t \cdot \cos t} = \csc t \cdot \sec t \\ \cot t + \tan t & \end{aligned} \quad \checkmark$$

11.  $\frac{\tan \theta \cot \theta}{\csc \theta} = \sin \theta$

$$\begin{aligned} &= \frac{\frac{1}{\sin \theta} \cdot \frac{1}{\cos \theta}}{\frac{1}{\sin \theta}} \\ &= \frac{1}{\cos \theta} \\ &= \sin \theta = \sin \theta \quad \checkmark \end{aligned}$$

$$\begin{aligned} 15. \quad \cos \cancel{x} (\tan x + \sin x \cot x) &= \sin x + \cos^2 x \\ &= \cos x \cdot \frac{\sin x}{\cos x} + \cos x \cdot \sin x \cdot \frac{\cos x}{\sin x} \\ &= \sin x + \cos^2 x = \sin x + \cos^2 x \quad \checkmark \end{aligned}$$

12.  $\sin^2 x (1 + \cot^2 x) = 1$

$$\begin{aligned} &= \sin^2 x (\csc^2 x) \\ &= \sin^2 x \left( \frac{1}{\sin^2 x} \right) \end{aligned}$$

$$= 1 = 1 \quad \checkmark$$

16.  $\frac{1 - \sin \theta}{\cos \theta} = \sec \theta - \tan \theta$

$$= \frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta}$$

$$= \sec \theta - \tan \theta = \sec \theta - \tan \theta \quad \checkmark$$

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17.  $\frac{\sin t}{\tan t} + \frac{\cos t}{\cot t} = \sin t + \cos t$

$$\begin{aligned} &= \frac{\sin t}{\frac{\sin t}{\cos t}} + \frac{\cos t}{\frac{\cos t}{\sin t}} \\ &= \sin t \cdot \frac{\cos t}{\sin t} + \cos t \cdot \frac{\sin t}{\cos t} \\ &= \cos t + \sin t = \sin t + \cos t \end{aligned}$$

18.  $1 - \frac{\sin^2 x}{1 + \cos x} = \cos x$

$$\begin{aligned} &= \frac{1 + \cos x}{1 + \cos x} - \frac{\sin^2 x}{1 + \cos x} \\ &= \frac{(1 + \cos x) - \sin^2 x}{1 + \cos x} \\ &= \frac{\cos^2 x + \cos x}{1 + \cos x} \end{aligned}$$

19.  $\csc^2 x \sec x = \sec x + \csc x \cot x$

$$\begin{aligned} &(\cot^2 x + 1) \sec x = \sec x + \frac{1}{\sin x} \\ &= \cot^2 x \cdot \sec x + \sec x \\ &= \frac{\cos^2 x}{\sin^2 x} \cdot \frac{1}{\cos x} + \sec x \\ &= \frac{\cos x}{\sin^2 x} + \sec x \end{aligned}$$

20.  $\sin^2 \beta (1 + \cot^2 \beta) = 1$

$$\begin{aligned} &= \sin^2 \beta / (\csc^2 \beta) \\ &= \sin^2 \beta \left( \frac{1}{\sin^2 \beta} \right) \\ &= 1 = 1 \checkmark \end{aligned}$$

$1 + \tan^2 \theta = \sec^2 \theta$

21.  $(\sec \theta + 1)(\sec \theta - 1) = \tan^2 \theta$

$= \sec^2 \theta - 1$

$= 1 + \tan^2 \theta - 1$

$= \tan^2 \theta = \tan^2 \theta$

22.  $\frac{(1 - \cos u)(1 + \cos u)}{\cos^2 u} = \tan^2 u$

$= \frac{1 - \cos^2 u}{\cos^2 u}$

$= \frac{\sin^2 u}{\cos^2 u}$

$= \tan^2 u = \tan^2 u \checkmark$

23.  $\frac{(1 + \tan^2 x)}{\sin^2 x + \cos^2 x} = \sec^2 x$

$= \frac{\sec^2 x}{1}$

$= \sec^2 x = \sec^2 x \checkmark$

24.  $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$

$= \frac{\cos^2 \theta}{\sin^2 \theta} - \sin^2 \theta$

$= \frac{\cos^2 \theta - \sin^2 \theta \cdot \sin^2 \theta}{\sin^2 \theta}$

$= \frac{1 - \sin^2 \theta - \sin \theta}{\sin^2 \theta}$

$= \frac{1 - \sin^2 \theta}{\sin^2 \theta} - \sin^2 \theta$

$= \frac{1 - \sin^2 \theta}{\sin^2 \theta} - 1 - \sin^2 \theta$

$= \frac{1}{\sin^2 \theta} - 1 - \sin^2 \theta$

$$\begin{aligned} \frac{\sin^2}{\cos^2} - \sin^2 &= \frac{\sin^2 - \sin^2 \cos^2}{\cos^2} \\ \frac{\sin^2}{\sin^2 (1 - \cos^2)} &= \frac{\sin^2 \cdot 1 - \cos^2}{\cos^2} = \tan^2 \theta \end{aligned}$$