

Name: _____

Date: _____

TRIG IDENTITIES

| Reciprocal Identities | Tangent and Cotangent Ratio Identities | Pythagorean Identities |
|---|---|---|
| $\csc \theta = \frac{1}{\sin \theta}$ $\sec \theta = \frac{1}{\cos \theta}$ $\cot \theta = \frac{1}{\tan \theta}$ | $\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cot \theta = \frac{\cos \theta}{\sin \theta}$ | $\sin^2 \theta + \cos^2 \theta = 1$ $1 + \cot^2 \theta = \csc^2 \theta$ $\tan^2 \theta + 1 = \sec^2 \theta$ |

DERIVE PYTHAGOREAN IDENTITIES

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

RULES FOR PROVING/VERIFYING WITH TRIG IDENTITIES

1. Leave one side alone
2. Substitute identities into function that will either cancel or convert to another trig function
3. Manipulate one side of equation so it will equal the other side of the equation.

Examples:

| | |
|--|---|
| <p>1. $\tan \theta = \frac{\sec \theta}{\csc \theta}$</p> $= \frac{1}{\cos \theta} \cdot \frac{1}{\sin \theta}$ $= \frac{\sin \theta}{\cos \theta}$ | <p>2. $\sin \theta \cot \theta = \cos \theta$</p> $\cancel{\sin \theta} \cdot \frac{\cos \theta}{\cancel{\sin \theta}}$ $\cos \theta = \cos \theta \checkmark$ |
|--|---|

$$\tan \theta = \tan \theta \checkmark$$

$$3. \sec \theta (1 - \sin^2 \theta) = \cos \theta$$

$$\frac{1}{\cos \theta} \cos^2 \theta$$

$$\cos \theta = \cos \theta \checkmark$$

$$4. \sin \theta \cos \theta (\tan \theta + \cot \theta) = 1$$

$$\cancel{\sin \theta} \cos \theta \frac{\sin \theta}{\cancel{\cos \theta}} + \cancel{\sin \theta} \cos \theta \frac{\cancel{\cos \theta}}{\sin \theta}$$

$$\sin^2 \theta + \cos^2 \theta$$

$$1 = 1 \checkmark$$

$$5. \frac{\sin \theta - \cos \theta}{\sin \theta} = 1 - \cot \theta$$

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

$$1 - \cot \theta = 1 - \cot \theta \checkmark$$

$$6. \frac{\cos^2 \theta}{1 - \sin \theta} = 1 + \sin \theta$$

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

$$\frac{(1 - \sin \theta)(1 + \sin \theta)}{1 - \sin \theta}$$

$$1 + \sin \theta = 1 + \sin \theta \checkmark$$

$$7. \sec x = \frac{\tan x}{\sin x}$$

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

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

$$= \frac{1}{\cos x} \quad \sec x = \sec x \checkmark$$

$$8. \sin x + \sin x \cdot \cot^2 x = \csc x$$

$$\sin x (1 + \cot^2 x)$$

$$\sin x \cdot \csc^2 x$$

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

$$\frac{1}{\sin x}$$

$$\csc x = \csc x \checkmark$$

$$9. \frac{\cos^2 \theta + \sin^2 \theta}{\cos^2 \theta} = \sec^2 \theta$$

$$\frac{1}{\cos^2 \theta} = \sec^2 \theta$$

$$\sec^2 \theta = \sec^2 \theta \checkmark$$

$$10. \sin^2 \theta \sec^2 \theta + \sin^2 \theta \csc^2 \theta = \sec^2 \theta$$

$$\sin^2 \theta \frac{1}{\cos^2 \theta} + \cancel{\sin^2 \theta} \frac{1}{\cancel{\sin^2 \theta}}$$

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

$$\sec^2 \theta = \sec^2 \theta \checkmark$$