Unit 5: Trigonometric Ratios- Proving Trig Identities Assignment. Name_____

*Prove the following identities on a separate sheet of paper.*

***Proving involves showing the "Left Side = Right Side".***

1. $\sin A \cot A = \cos A$
2. $\cot \theta \sec \theta = \csc \theta$
3. $\sin \theta \sec \theta = \tan \theta$
6. $\cot A \sec A \sin A = 1$
7. $(1 - \cos^2 A) \csc^2 A = 1$
8. $\cot^2 \theta (1 - \cos^2 \theta) = \cos^2 \theta$
10. $(1 - \cos^2 A) \sec^2 A = \tan^2 A$
11. $(1 + \tan^2 A) \cos^2 A = 1$
12. $(\sec^2 A - 1) \cot^2 A = 1$
14. $\sin^2 A (1 + \cot^2 A) = 1$
15. $(\csc^2 \theta - 1) \tan^2 \theta = 1$
16. $\sin^2 \theta \cot^2 \theta + \sin^2 \theta = 1$
17. $(1 - \cos^2 A)(1 + \cot^2 A) = 1$
18. $(1 + \tan^2 A)(1 - \sin^2 A) = 1$
19. $\frac{\sin A}{\csc A} + \frac{\cos A}{\sec A} = 1$
20. $\frac{\sec A}{\cos A} - \frac{\tan A}{\cot A} = 1$
21. $\sin^4 \theta - \cos^4 \theta = 2 \sin^2 \theta - 1$
22. $\sec^4 \theta - 1 = 2 \tan^2 \theta + \tan^4 \theta$
23. $\csc^4 A - 1 = 2 \cot^2 A + \cot^4 A$
24. $\frac{\sin A \cot^2 A}{\cos A} = \frac{1}{\tan A}$
25. $\frac{\sec^2 A \cot A}{\csc^2 A} = \tan A$
26. $\sec \theta - \tan \theta \sin \theta = \cos \theta$
27. $\tan \theta + \cot \theta = \sec \theta \csc \theta$

## Key Ideas

- A trigonometric identity is an equation involving trigonometric ratios that is true for all values of the variable.
- Some trigonometric identities are a result of a definition, while others are derived from relationships that exist among trigonometric ratios.

## Need to Know

- Some trigonometric identities that are important to remember are shown below ($0° \le \theta \le 360°$).

| Identities Based on Definitions | Identities Derived from Relationships | |
|---|---|---|
| **Reciprocal Identities** | **Quotient Identities** | **Pythagorean Identities** |
| $\csc \theta = \frac{1}{\sin \theta}$, where $\sin \theta \neq 0$ | $\tan \theta = \frac{\sin \theta}{\cos \theta}$, where $\cos \theta \neq 0$ | $\sin^2 \theta + \cos^2 \theta = 1$ |
| $\sec \theta = \frac{1}{\cos \theta}$, where $\cos \theta \neq 0$ | $\cot \theta = \frac{\cos \theta}{\sin \theta}$, where $\sin \theta \neq 0$ | $1 + \tan^2 \theta = \sec^2 \theta$ |
| $\cot \theta = \frac{1}{\tan \theta}$, where $\tan \theta \neq 0$ | | $1 + \cot^2 \theta = \csc^2 \theta$ |

- To prove that a given trigonometric equation is an identity, both sides of the equation need to be shown to be equivalent. This can be done by
  - simplifying the more complicated side until it is identical to the other side or manipulating both sides to get the same expression
  - rewriting all trigonometric ratios in terms of *x*, *y*, and *r*
  - rewriting all expressions involving tangent and the reciprocal trigonometric ratios in terms of sine and cosine
  - applying the Pythagorean identity where appropriate
  - using a common denominator or factoring as required