

Name: _____

Period: _____

Steps in proving identities

1. Pick the side of the equation you wish to work with and write it down. Usually it is easier to start with the more complicated member. (**you must not work with both sides of the equation**)
2. Look for algebraic things to do:
 - a. If there are two terms and you want only one:
 1. Add fractions
 2. Factor something
 - b. Multiply by a clever form of 1:
 1. Multiply a numerator or denominator by its conjugate or
 2. Get a desired expression in numerator or denominator.
 - c. Do any obvious algebra such as distributing, squaring or multiplying polynomials.
3. Look for trigonometric things to do:
 - a. Look for familiar trigonometric expressions like:
 $1 - \cos^2 x$ $\cos x \sec x$ or $\frac{\sin x}{\cos x}$
 - b. If there are *squares* of functions, think of Pythagorean properties
 - c. Reduce the number of different functions, transforming them to the ones you want in the answer.
4. Keep looking at the answer to make sure you are headed in the right direction.

Precal Assignment 28 – Verifying Basic Identities

Verify each identity

1. $\tan\theta \cos\theta = \sin\theta$

2. $1 - 2 \sin^2\theta = 2\cos^2\theta - 1$

3. $1 - \cos\theta \sin\theta \cot\theta = \sin^2\theta$

4. $\cos\theta (\csc\theta - \sec\theta) = \cot\theta - 1$

5. $\csc^2\theta - \csc^2\theta \cos^2\theta = 1$

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

7. $\tan\theta (\cot\theta + \tan\theta) = \sec^2\theta$

8. $\sin^2\theta (1 + \cot^2\theta) = 1$

9. $(1 - \sin^2\theta) \sec\theta \tan\theta = \sin\theta$

10. $\cos\theta(1 + \tan^2\theta) = \sec\theta$

11. $\csc\theta + \cot\theta = \frac{\csc^2\theta - \cot^2\theta}{\csc\theta - \cot\theta}$

12. $(2\cos\theta + 3\sin\theta)^2 + (3\cos\theta - 2\sin\theta)^2 = 13$

13. $\frac{2\sin^2\theta - 5\sin\theta + 3}{\sin^2\theta - 1} = \frac{2\sin\theta - 3}{1 + \sin\theta}$

14. $\frac{\tan^2\theta - 1}{3\tan^2\theta + 2\tan\theta - 1} = \frac{\tan\theta - 1}{3\tan\theta - 1}$

15. $\frac{\sin^2\theta + 2\cos\theta - 1}{\sin^2\theta + 3\cos\theta - 3} = \frac{1}{1 - \sec\theta}$

Precal Assignment 29 – Verifying Basic Identities

Verify each identity

1. $\cos\theta \csc\theta \tan\theta = 1$

2. $\cot^2\theta - \csc^2\theta = -1$

3. $1 - \sin\theta \cos\theta \tan\theta = \cos^2\theta$

4. $\frac{1 + \sin\theta}{\sin\theta} = 1 + \csc\theta$

5. $\frac{\sin\theta}{1 - \cos^2\theta} = \csc\theta$

6. $1 + \sec^2\theta \sin^2\theta = \sec^2\theta$

7. $\cot\theta (\tan\theta + \cot\theta) = \csc^2\theta$

8. $1 + \cot^2\theta = \sec^2\theta \cot^2\theta$

9. $(1 - \cos^2\theta) \csc\theta \cot\theta = \cos\theta$

10. $\frac{\sin\theta}{1 - \sin^2\theta} = \sec\theta \tan\theta$

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

12. $\sin\theta \tan\theta = \sec\theta - \cos\theta$

13. $\frac{\sec\theta}{\tan\theta + \cot\theta} = \sin\theta$

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

15. $\frac{\tan^2\theta}{\sec\theta + 1} = \frac{1 - \cos\theta}{\cos\theta}$

16. $(3\cos\theta + 4\sin\theta)^2 + (4\cos\theta - 3\sin\theta)^2 = 25$

17. $\frac{\csc\theta}{\tan\theta + \cot\theta} = \cos\theta$

18. $\sqrt{\frac{1 - \cos\theta}{1 + \cos\theta}} = \frac{1}{\csc\theta + \cot\theta}$

Precal: Building Identities

Building from $1 = 1$

By starting with the most fundamental identity of all, $1 = 1$, you can create new identities as complex as you would like them to be.

First, think of ways to write 1 using trigonometric identities.

Example: $1 = \cos A \sec A$
 $1 = \csc^2 A - \cot^2 A$

Choose two such expressions and write a new identity.

$$\cos A \sec A = \csc^2 A - \cot^2 A$$

Now multiply the terms of the identity by the terms of another identity of your choosing, preferably one that will allow some simplification upon multiplication.

$$\cos A \sec A = \csc^2 A - \cot^2 A$$

$$* \frac{\sin A}{\cos A} = \tan A$$

$$\left(\frac{\sin A}{\cos A} \right) \cancel{\cos A} \sec A = \tan A (\csc^2 A - \cot^2 A)$$

$$\sin A \sec A = \tan A \csc^2 A - \tan A \cot^2 A$$

Reduce to create a new identity

$$\sin A \sec A = \tan A \csc^2 A - \cot A$$

Beginning with $1 = 1$, create three trigonometric identities

1. _____

2. _____

2. _____

Verify that each of the identities you created is an identity.