

# 5.2 Trig Proofs

Turn in 5.1 & yesterday's assignment!!!! (it's late - one is a QUIZ grade)

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

Warm-Up Wednesday

Transform  $(1 + \cos A)(1 - \cos A)$  to  $\sin^2 A$

$$1 - \cancel{\cos A} + \cancel{\cos A} - \cos^2 A$$

$$\begin{aligned} & \downarrow - \cos^2 A \\ \cancel{\cos^2 A} + \sin^2 A - \cancel{\cos^2 A} \end{aligned}$$

$$\sin^2 A \quad \text{😊}$$

# 5.2 Trig Proofs

EQ: How do I prove trig expressions are equivalent?

$$1. \quad \overbrace{\sec^2 x - \sin^2 x}^{a^2 - b^2} \cdot \overbrace{\sec^2 x}^{a^2 = a^2(1-b^2)} = 1$$

★ choose side  
↳ more complicated

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

$$\sec^2 x (\cos^2 x + \cancel{\sin^2 x} - \cancel{\sin^2 x})$$

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

$$\frac{1}{\cancel{\cos^2 x}} \left( \frac{\cancel{\cos^2 x}}{1} \right)$$

1 😊

# 5.2 Trig Proofs

EQ: How do I prove trig expressions are equivalent?

2.  $1 + 2 \tan^2 x = \sec^4 x - \tan^4 x$

$$(\overset{a}{\sec^2 x})^2 - (\overset{b}{\tan^2 x})^2$$

\* diff. of squares

$$a^2 - b^2 =$$

$$(a+b)(a-b)$$

$$(\sec^2 x + \tan^2 x)(\sec^2 x - \tan^2 x)$$

FC:  $1 + \tan^2 x = \sec^2 x$

$$(1 + \tan^2 x + \tan^2 x)(1 + \cancel{\tan^2 x} - \cancel{\tan^2 x})$$

$$(1 + 2 \tan^2 x)(1)$$



# 5.2 Trig Proofs

EQ: How do I prove trig expressions are equivalent?

3.

$$\underline{\csc x \cdot \cos^2 x + \sin x = \csc x}$$

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

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

$$\frac{\cos^2 x}{\sin x} + \frac{\sin^2 x}{\sin x}$$

$$\frac{\cos^2 x + \sin^2 x}{\sin x}$$

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

$$\csc x$$



★ Find common denominator

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EQ: How do I prove trig expressions are equivalent?

## Helpful techniques:

- Pick the side you wish to work on and write it down. It is usually easiest to start with the more complicated side.
- Look for algebraic things to do:
  - If there are two terms and you want only one:
    - a.) add fractions
    - b.) factor something out
  - Multiply by a clever form of 1:
    - a.) to multiply a numerator or denominator by its conjugate
    - b.) to get a desired expression in the numerator or denominator
  - Do any obvious algebra or arithmetic such as distributing, squaring, or multiplying polynomials
- Look for trigonometric things to do:
  - Search for familiar trigonometric expressions like  $1 - \cos^2 x$ ,  $\cos x \cdot \sec x$ , or  $\frac{\sin x}{\cos x}$ .
  - If there are squares of functions, think of Pythagorean properties.
  - Reduce the number of different functions, transforming them to the ones you want in your answer.
- Keep looking at the answer to make sure you are headed in the right direction.

#1-14 DUE FRIDAY  
 5.2 Proving Trig Identities Name: \_\_\_\_\_

Prove each identity. You may start on either side, but once you start you must work only on one side! Use a separate sheet of paper.

1.  $\sec x(\sec x - \cos x) = \tan^2 x$

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

3.  $\sin x(\csc x - \sin x) = \cos^2 x$

4.  $\cos x(\sec x - \cos x) = \sin^2 x$

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

6.  $\cos^2 x + \tan^2 x \cos^2 x = 1$

7.  $(\sec x + 1)(\sec x - 1) = \tan^2 x$

8.  $(1 + \sin x)(1 - \sin x) = \cos^2 x$

9.  $\sec^2 x + \tan^2 x \sec^2 x = \sec^4 x$

10.  $\cot^2 x \csc^2 x - \cot^2 x = \cot^4 x$

11.  $\cos^4 x - \sin^4 x = 1 - 2\sin^2 x$

12.  $\sec^4 x - \tan^4 x = 1 + 2\tan^2 x$

13.  $\frac{1}{\sin x \cos x} - \frac{\cos x}{\sin x} = \tan x$

14.  $\frac{\sec x}{\sin x} - \frac{\sin x}{\cos x} = \cot x$

15.  $\frac{\sin x}{\csc x} + \frac{\cos x}{\sec x} = 1$

16.  $\frac{1}{\sec^2 x} + \frac{1}{\csc^2 x} = 1$

17.  $\frac{1}{1 + \cos x} = \csc^2 x - \csc x \cot x$

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

19.  $\frac{\cos x}{\sec x - 1} - \frac{\cos x}{\tan^2 x} = \cot^2 x$

20.  $\frac{\sin x}{1 - \cos x} + \frac{1 - \cos x}{\sin x} = 2 \csc x$

21.  $\frac{\sec x}{\sec x - \tan x} = \sec^2 x + \sec x \tan x$

22.  $\frac{1 + \sin x}{1 - \sin x} = 2 \sec^2 x + 2 \sec x \tan x - 1$

23.  $\sin^3 x \cos^2 x = \sin^3 x - \sin^5 x$

24.  $\sin^3 x \cos^3 x = \cos^3 x \sin x - \cos^4 x \sin x$

25.  $\sec^2 x + \csc^2 x = \sec^2 x \csc^2 x$

26.  $\sec x + \tan x = \frac{1}{\sec x - \tan x}$

27.  $\frac{1 - 3 \cos x - 4 \cos^2 x}{\sin^2 x} = \frac{1 - 4 \cos x}{1 - \cos x}$

28.  $\frac{\sec^2 x - 6 \tan x + 7}{\sec^2 x - 5} = \frac{\tan x - 4}{\tan x + 2}$

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Closing Prove the identity.

$$\frac{\sin x}{\csc x} + \frac{\cos x}{\sec x} = 1$$

QUIZ TMR!!!