

Chapter 3 – Identity Fundamentals

Reciprocal Properties

$$\csc x = \frac{1}{\sin x} \quad \sec x = \frac{1}{\cos x} \quad \cot x = \frac{1}{\tan x}$$

$$\sin x = \frac{1}{\csc x} \quad \cos x = \frac{1}{\sec x} \quad \tan x = \frac{1}{\cot x}$$

Quotient Properties

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

Pythagorean Properties

$$\sin^2 x + \cos^2 x = 1 \quad 1 + \tan^2 x = \sec^2 x \quad \cot^2 x + 1 = \csc^2 x$$

Guidelines for establishing identities:

- 1) It is almost always preferable to start with the side containing the more complicated expression.
- 2) Rewrite sums or differences of quotients as a single quotient.
- 3) Sometimes rewriting one side in terms of sines and cosines only will help.
- 4) Always keep your goal in mind. As you manipulate one side of the expression, you must keep in mind the form of the expression on the other side.
- 5) Reduce fractions
- 6) Add or subtract fractions
- 7) Find a common denominator
- 8) Factor
- 9) Distribute/FOIL
- 10) Change the order of adding or multiplying (commutative property)
- 11) Multiply by 1 in the form of your choice