The Trig Identity Checklist of Possibilities

Start with the side of the identity that looks the most complicated and try to make it simpler.
Keep in mind that you can work on BOTH sides of the trig ratio

Making things simpler involves
- changing secondary ratios to primary
- changing TAN into SIN and COS
- changing double angles into single angles
- changing addition of angles into single angles

As you look at the following, always keep an eye on the other side. Make sure that if you have a choice in what identity to use, that it will match up with the other side.

Here are some questions that should be running through your head

- ☐ Can I use the reciprocal identities to turn secondary ratios into primary ratios
- ☐ Can I use a double angle formula to change a double angle into single angles
- ☐ Can I use a co-function identity to turn a "sum/difference" into a single angle
- ☐ Can I use a compound angle formula to turn a "sum/difference" into a single angle
- ☐ Can I use the quotient identity to turn Tan into Sin and Cos
- ☐ Can I get a common denominator
- ☐ Can I break apart a fraction into the sum/difference of two fractions (with the same denominator)
- ☐ Can I take out a common factor
- ☐ Can I factor as a difference of squares
- ☐ Can I factor it like a quadratic
- ☐ Can I group the terms to factor them
- ☐ Can I cancel any factors from the numerator and denominator
- ☐ Can I put any terms together (simplify)
- ☐ Can I put but a $\sin^2 x$ next to a $\cos^2 x$ and replace them with a "1" (Pythagorean identity)
- ☐ Can I expand and simplify
- ☐ Can I replace $\sin^2 x$ with a $(1-\cos^2 x)$ or vice versa (Pythagorean Identity)
- ☐ CAN I DO ANYTHING ABOVE ON THE OTHER SIDE OF THE IDENTITY

Please note the following :

From the quotient identity $\tan x = \dfrac{\sin x}{\cos x}$

this also means that $\tan^2 x = \dfrac{\sin^2 x}{\cos^2 x}$ or $\tan 2x = \dfrac{\sin 2x}{\cos 2x}$ or $\tan(x+y) = \dfrac{\sin(x+y)}{\cos(x+y)}$

this applies to other identities as well.

To try and clear up some common misconceptions…

$\sin(x+y) \neq \sin x + \sin y$ *(see the compound angle identities)*

You can NOT make this cancellation

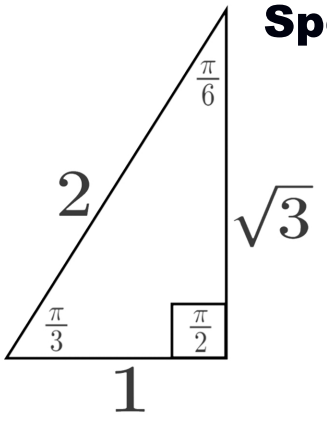
$\dfrac{\cancel{\sin x} + \cos y}{\cancel{\sin x}} \neq \cos y$ or $1 + \cos y$

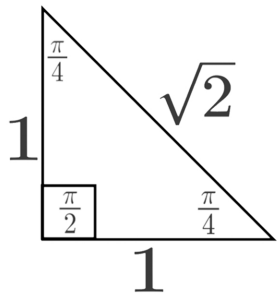
(you may only cancel ***FACTORS*** of products. The numerator is a sum, not a product!)

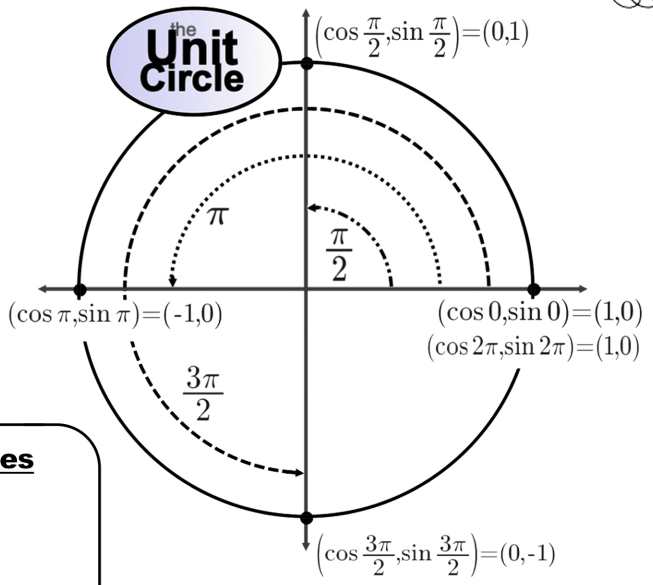
Trigonometry Help Page

Common identities and helpful diagrams

Special Triangles







Reciprocal Identities

$$csc\theta = \frac{1}{sin\theta}$$

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

$$cot\theta = \frac{1}{tan\theta}$$

Quotient Identities

$$tan\theta = \frac{sin\theta}{cos\theta}$$

$$cot\theta = \frac{cos\theta}{sin\theta}$$

Pythagorean Identities

$$sin^2\theta + cos^2\theta = 1$$

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

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

Double Angle Formulas

$$sin2\theta = 2sin\theta cos\theta$$

$$cos2\theta = cos^2\theta - sin^2\theta$$

$$cos2\theta = 2cos^2\theta - 1$$

$$cos2\theta = 1 - 2sin^2\theta$$

$$tan2\theta = \frac{2tan\theta}{1 - tan^2\theta}$$

Compound Angle Formulas

$$\sin(\alpha + \beta) = sin\alpha\, cos\beta + cos\alpha\, sin\beta$$

$$\sin(\alpha - \beta) = sin\alpha\, cos\beta - cos\alpha\, sin\beta$$

$$\cos(\alpha + \beta) = cos\alpha\, cos\beta - sin\alpha\, sin\beta$$

$$\cos(\alpha - \beta) = cos\alpha\, cos\beta + sin\alpha\, sin\beta$$

$$\tan(\alpha + \beta) = \frac{tan\alpha + tan\beta}{1 - tan\alpha\, tan\beta}$$

$$\tan(\alpha - \beta) = \frac{tan\alpha - tan\beta}{1 + tan\alpha\, tan\beta}$$

Co-Related Angle Identities (a.k.a. Cofunction Identities)

$$sin\left(\frac{\pi}{2} - \theta\right) = cos\theta \qquad sin\left(\frac{\pi}{2} + \theta\right) = cos\theta \qquad sin\left(\frac{3\pi}{2} - \theta\right) = -cos\theta \qquad sin\left(\frac{3\pi}{2} + \theta\right) = -cos\theta$$

$$cos\left(\frac{\pi}{2} - \theta\right) = sin\theta \qquad cos\left(\frac{\pi}{2} + \theta\right) = -sin\theta \qquad cos\left(\frac{3\pi}{2} - \theta\right) = -sin\theta \qquad cos\left(\frac{3\pi}{2} + \theta\right) = sin\theta$$

$$tan\left(\frac{\pi}{2} - \theta\right) = cot\theta \qquad tan\left(\frac{\pi}{2} + \theta\right) = -cot\theta \qquad tan\left(\frac{3\pi}{2} - \theta\right) = cot\theta \qquad tan\left(\frac{3\pi}{2} + \theta\right) = -cot\theta$$

Related Angles

$$sin(\pi - \theta) = sin\theta \qquad sin(\pi + \theta) = -sin\theta \qquad sin(2\pi - \theta) = -sin\theta \qquad sin(-\theta) = -sin\theta$$

$$cos(\pi - \theta) = -cos\theta \qquad cos(\pi + \theta) = -cos\theta \qquad cos(2\pi - \theta) = cos\theta \qquad cos(-\theta) = cos\theta$$

$$tan(\pi - \theta) = -tan \qquad tan(\pi + \theta) = tan\theta \qquad tan(2\pi - \theta) = -tan\theta \qquad tan(-\theta) = -tan\theta$$