6.3 Proving Identities

↳ Express both sides in equivalent forms.

Show left side = right side

* Do not move terms across the equal sign (not solving)

Common Strategies

↳ express everything in terms of $\sin x, \cos x$

↳ common denominators

↳ factor binomials & trinomials

↳ use your pythagorean identities

↳ replacing double angle identities, sum & difference

↳ multiply by conjugate or difference of squares

ex. 1

$$1-\sin^2 x = \sin x \cos x \cot x$$

Identity

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

$\cos^2 x$

ex 2. $\frac{1-\cos 2x}{\sin 2x} = \tan x$

double angle

$\frac{1-(1-2\sin^2 x)}{2\sin x \cos x}$ | $\frac{\sin x}{\cos x}$

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

$\frac{\sin x}{\cos x} = \frac{\sin x}{\cos x}$

ex. 3 $\frac{1-\cos x}{\sin x} = \frac{\sin x}{1+\cos x}$

$1-\cos^2 x$
$(1+\cos)(1-\cos x)$

$\frac{1-\cos x}{\sin x}\left(\frac{1+\cos x}{1+\cos x}\right)$

$\frac{1-\cos^2 x}{\sin x(1+\cos x)}$

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

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

replace double angles

ex. 4 $\cot x - \csc x = \frac{\cos 2x - \cos x}{\sin 2x + \sin x}$

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

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

$\frac{2\cos^2 x - 1 - \cos x}{(2\sin x \cos x + \sin x)}$

$\frac{2\cos^2 x - \cos x - 1}{\sin x(2\cos x + 1)}$

$\frac{(2\cos x + 1)(\cos x - 1)}{\sin x(2\cos x + 1)}$

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

Try these

1. $\frac{1}{(1+\sin x)} = \frac{\sec x - \sin x \sec x}{\cos x}$

2. $\frac{\sin 2x}{\cos 2x + 1} = \tan x$

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