

- 4.5- Trig. Identities - Day 3

Difficulty going up today!

EXAMPLE 6

Multiplying the Numerator and Denominator by the Same Factor to Verify an Identity

Verify the identity: $\frac{\sin x}{1 + \cos x} = \frac{1 - \cos x}{\sin x}$.

$$\begin{aligned}
 &= \frac{\sin x}{(1 + \cos x)} \cdot \frac{(1 - \cos x)}{(1 - \cos x)} \\
 &= \frac{\sin x - \sin x \cos x}{1 - \cos x + \cos x - \cos^2 x} \\
 &= \frac{\sin x (1 - \cos x)}{1 - \cos^2 x} \\
 &= \frac{\sin x (1 - \cos x)}{\sin^2 x} \\
 &= \frac{1 - \cos x}{\sin x} \quad \checkmark
 \end{aligned}$$

EXAMPLE 7

Changing to Sines and Cosines to Verify an Identity

Verify the identity: $\frac{\tan x + \sin x}{1 + \cos x} = \tan x$

$$\begin{aligned}
 &= \frac{\frac{\sin x}{\cos x} + \frac{\sin x \cdot \cos x}{1 \cdot \cos x}}{1 + \cos x} \\
 &= \frac{\sin x + \sin x \cos x}{\cos x (1 + \cos x)} \\
 &= \frac{\sin x (1 + \cos x)}{\cos x (1 + \cos x)} \\
 &= \frac{\sin x}{\cos x} \\
 &= \tan x \quad \checkmark
 \end{aligned}$$

Additional Example #1:

Verify the identity $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$.

$$\begin{aligned}
 &= \frac{\sin^2 \theta}{\cos^2 \theta} - \frac{\sin^2 \theta}{1} \cdot \frac{\cos^2 \theta}{\cos^2 \theta} \\
 &= \frac{\sin^2 \theta - \sin^2 \theta \cdot \cos^2 \theta}{\cos^2 \theta} \quad \text{GCF!} \\
 &= \frac{\sin^2 \theta (1 - \cos^2 \theta)}{\cos^2 \theta} \\
 &= \frac{\sin^2 \theta (\sin^2 \theta)}{\cos^2 \theta} \\
 &= \frac{\sin^2 \theta}{\cos^2 \theta} \cdot \sin^2 \theta \\
 &= \tan^2 \theta \cdot \sin^2 \theta \quad \checkmark
 \end{aligned}$$