Warm Up

Prove the following identity:

$$\frac{\sin x}{1-\cos x} - \frac{\sin x \cos x}{1+\cos x} = \csc x\left(1+\cos^2 x\right)$$

$\sin x(1+\cos x) - \sin x\cos x(1-\cos x)$

FOIL → $(1-\cos x)(1+\cos x)$

$\sin x + \sin x\cos x - \sin x\cos x + \sin x\cos^3 x$

$1-\cos^2 x$

Factor → $\dfrac{\sin x + \sin x\cos^2 x}{\sin^2 x}$

$\dfrac{\sin x\left(1+\cos^2 x\right)}{\sin^2 x}$

$\dfrac{1+\cos^2 x}{\sin x}$

$\perp \sin x \quad (1+\cos^2 x)$

$\dfrac{1+\cos^2 x}{\sin x}$

Questions from Homework

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

$\sin^2 x - 2\sin x\cos x + \cos^2 x + \sin^2 x + 2\sin x\cos x + \cos^2 x$

$2\sin^2 x + 2\cos^2 x$

$2(\sin^2 x + \cos^2 x)$

$2(1)$

2

⑩ $\dfrac{1+\tan x}{1+\cot x} = \tan x$

$\dfrac{\sin x}{\cos x}$

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

$\dfrac{\cos x + \sin x}{\cos x} \div \dfrac{\sin x + \cos x}{\sin x}$

$\dfrac{\sin x + \cos x}{\cos x} \times \dfrac{\sin x}{\sin x + \cos x}$

$\dfrac{\sin x}{\cos x}$

⑫ $\csc x(\sin x + \cos x) = 1 + \cot x$

$\left(\dfrac{1}{\sin x}\right)(\sin x + \cos x)$ $\qquad$ $1 + \dfrac{\cos x}{\sin x}$

$\dfrac{\sin x + \cos x}{\sin x}$ $\qquad$ $\dfrac{\sin x + \cos x}{\sin x}$

⑮ $\tan^3 x \sec^2 x - \tan^3 x = \tan^5 x$

$\tan^3 x(\sec^2 x - 1)$

$(\tan^3 x)(\tan^2 x)$

$\tan^5 x$

⑮ $\tan^3 x \sec^2 x - \tan^3 x = \tan^5 x$

$\left(\frac{\sin^3 x}{\cos^3 x}\right)\left(\frac{1}{\cos^2 x}\right) - \frac{\sin^3 x}{\cos^3 x}$

$\frac{\sin^3 x}{\cos^5 x} - \frac{\sin^3 x}{\cos^3 x}$

$\frac{\sin^3 x - \sin^3 x \cos^2 x}{\cos^5 x}$

$\frac{\sin^3 x (1 - \cos^2 x)}{\cos^5 x}$

$\frac{(\sin^3 x)(\sin^2 x)}{\cos^5 x}$

$\frac{\sin^5 x}{\cos^5 x}$

$\frac{\sin^5 x}{\cos^5 x}$

③ $\cos A + \tan A \sin A = \sec A$

$\cos A + \left(\frac{\sin A}{\cos A}\right)\sin A$

$\frac{\cos A}{1} + \frac{\sin^2 A}{\cos A}$

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

$\frac{1}{\cos A}$

$\frac{1}{\cos A}$

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Trig Identities #4

(18) $\dfrac{\sin^4\theta-\cos^4\theta}{\sin^3\theta\cos^3\theta-\cos^4\theta} =$ $\csc^2\theta$ / $\cot^2\theta$

Diff of Squares

common factor

Pythagorean

$\dfrac{(\sin^2\theta+\cos^2\theta)(\sin^2\theta-\cos^2\theta)}{\cos^3\theta(\sin^2\theta-\cos^2\theta)}$

$\dfrac{1}{\sin^2\theta} \div \dfrac{\cos^2\theta}{\sin^2\theta}$

$\dfrac{1}{\sin\theta} \cdot \dfrac{\sin^2\theta}{\cos^3\theta}$

$\dfrac{1}{\cos^3\theta}$

$\dfrac{1}{\cos^2\theta}$

(6) $\sec^2\theta-\sin^2\theta = \cos^3\theta+\tan^2\theta$

$\tan^2\theta+1-(1-\cos^2\theta)$

$\tan^2\theta+1-1+\cos^2\theta$

$\cos^3\theta+\tan^2\theta$

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(5) $\sec^2\theta-\sin^2\theta = \cos^2\theta+\tan^2\theta$

$\sec^2\theta-\tan^2\theta = \sin^2\theta+\cos^2\theta$

$1 = 1$

Bonus

Prove the following identity:

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

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

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

Pythagorean = 1

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

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

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

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

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

Quiz & Homework