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Lesson 6.5 – Practice with Proving Trigonometric Identities

I. Verify Each Identity (Work with each other)

1. $\sin^3 x \cos^4 x = (\cos^4 x - \cos^6 x)\sin x$

$= \cos^4 x\,(1 - \cos^2 x)\sin x$

$= \cos^4 x\,(\sin^2 x)\sin x$

$= \sin^3 x \cos^4 x$

2. $\sec^2 y - \cot^2\left(\frac{\pi}{2} - y\right) = 1$

$\sec^2 y - \tan^2 y = 1$

$1 = 1$

3. $(\sin^4 \beta - 2\sin^2 \beta + 1)\cos \beta = \cos^5 \beta$

$(2\sin^2 \beta - 1)^2 \cos \beta =$

$(-(1 - 2\sin^2 \beta))^2 \cos \beta =$

$(-(\cos^2 \beta))^2 \cos \beta =$

$\cos^4 \beta \cos \beta =$

$\cos^5 \beta =$

4. $\frac{1+\sin\theta}{\cos\theta} + \frac{\cos\theta}{1+\sin\theta} = 2\sec\theta$

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

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

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

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

$\frac{2}{\cos\theta} = \sec\theta$

5. $\frac{\cos x - \cos y}{\sin x + \sin y} + \frac{\sin x - \sin y}{\cos x + \cos y} = 0$

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

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

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

0

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

$\frac{\cos x(1-\tan x) - \cos x}{1-\tan x} =$

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

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

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

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

7. $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \frac{1-\cos\theta}{|\sin\theta|}$

$\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} \cdot \sqrt{\frac{1-\cos\theta}{1-\cos\theta}}$

$\sqrt{\frac{(1-\cos\theta)^2}{1-\cos^2\theta}}$

$\frac{1-\cos\theta}{\sqrt{\sin^2\theta}}$

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

8. $\sin^4 x + \cos^4 x = 1 - 2\cos^2 x + 2\cos^4 x$

$(1 - \cos^2 x)^2 + \cos^4 x =$

$1 - 2\cos^2 x + \cos^4 x + \cos^4 x$

$1 - 2\cos^2 x + 2\cos^4 x$