Even/Odd Identities

Even: $\cos(-\theta) = \cos(\theta)$ $\quad$ $\sec(-\theta) = \sec(\theta)$

Odd: $\sin(-\theta) = -\sin(\theta)$ $\quad$ $\csc(-\theta) = -\csc\theta)$

Odd: $\tan(-\theta) = -\tan(\theta)$ $\quad$ $\cot(-\theta) = -\cot(\theta)$

ex: $$\frac{\cos(-\theta)}{1+\sin(-\theta)} = \sec\theta + \tan\theta$$

$$\frac{(1+\sin\theta)}{(1+\sin\theta)} \frac{\cos(\theta)}{(1-\sin(\theta))} = \sec\theta + \tan\theta$$

$$\frac{(1+\sin\theta)\cos\theta}{1-\sin^2\theta} = \sec\theta + \tan\theta$$

$$\frac{(1+\sin\theta)\cancel{\cos\theta}}{\cos^{\cancel{2}}\theta} = \sec\theta + \tan\theta$$

$$\frac{1+\sin\theta}{\cos\theta} = \sec\theta + \tan\theta$$

$$\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = \sec\theta + \tan\theta$$

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ex: $\dfrac{\sec(-x)}{\csc(-x)} = -\tan x$

$\dfrac{\sec(x)}{-\csc(x)} = -\tan x$

$\dfrac{1}{\cos x} \cdot \dfrac{-\sin x}{1} = -\tan x$

Co-function Identities

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

$\sec\left(\frac{\pi}{2}-\theta\right) = \csc\theta$ $\quad$ $\csc\left(\frac{\pi}{2}-\theta\right) = \sec\theta$

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

ex: $\dfrac{\csc\left(\frac{\pi}{2}-x\right)}{\tan\left(\frac{\pi}{2}-x\right)} = \dfrac{\sin x}{\cos^2 x}$

$\dfrac{\sec x}{\cot x} = \dfrac{\sin x}{\cos^2 x}$

$\dfrac{\frac{1}{\cos x}}{\frac{\cos x}{\sin x}} = \dfrac{\sin x}{\cos^2 x}$

$\dfrac{1}{\cos x} \cdot \dfrac{\sin x}{\cos x} = \dfrac{\sin x}{\cos^2 x}$

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Misc. Identities

ex: $\csc^4 x - 2\csc^2 x + 1 = \cot^4 x$

$$(\csc^2 x - 1)(\csc^2 x - 1) = \cot^4 x$$

$$\cot^2 x \cdot \cot^2 x = \cot^4 x$$

* $x^4 - 2x^2 + 1 = (x^2 - 1)(x^2 - 1)$

ex: $\sec^4\theta - \tan^4\theta = 1 + 2\tan^2\theta$

$$(\sec^2\theta + \tan^2\theta)(\sec^2\theta - \tan^2\theta) = 1 + 2\tan^2\theta$$

$$(1 + \tan^2\theta + \tan^2\theta) \cdot 1 = 1 + 2\tan^2\theta$$

$$1 + 2\tan^2\theta = 1 + 2\tan^2\theta$$

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