Simplifying Trig Expressions

$\cos(\theta)\tan(\theta)$

$\cos\theta \cdot \frac{\sin\theta}{\cos\theta} = \boxed{\sin\theta}$

$\sin(\theta)\cot(\theta)$

$\sin\theta \cdot \frac{\cos\theta}{\sin\theta} = \boxed{\cos\theta}$

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

$\frac{1}{\sin^2\theta} \cdot \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta} = \boxed{\sec^2\theta}$

$\sin(x)\sec(x)\cot^2(x)$

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

$= \boxed{\cot(x)}$

$\cot(x)\csc(x)\tan^2(x)$

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

$= \boxed{\sec(x)}$

$\frac{1-\sin^2(x)}{\cos^2(x)-1} = \frac{\cos^2(x)}{-\sin^2(x)} = \boxed{-\cot^2(x)}$

Name: Key

$\cos(\theta)[\sec(\theta)-\cos(\theta)]$

$\cos\theta\sec\theta - \cos^2\theta$

$\left(\frac{\cos\theta}{1} \cdot \frac{1}{\cos\theta}\right) - \cos^2\theta$

$1 - \cos^2\theta = \boxed{\sin^2\theta}$

$\sin(\theta)[\csc(\theta)-\sin(\theta)]$

$\sin\theta\csc\theta - \sin^2\theta$

$\left(\frac{\sin\theta}{1} \cdot \frac{1}{\sin\theta}\right) - \sin^2\theta$

$1 - \sin^2\theta$

$\boxed{\cos^2\theta}$

$\sin(x)[\cot(x)+\tan(x)]$

$\sin(x)\cot(x) + \sin(x)\tan(x)$

$\left[\frac{\sin(x)}{1} \cdot \frac{\cos(x)}{\sin(x)}\right] + \left[\frac{\sin(x)}{1} \cdot \frac{\sin(x)}{\cos(x)}\right]$

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

$\frac{\sin(x)[\cos^2(x)+\sin^2(x)]}{\sin(x)\cos(x)} = \frac{1}{\cos(x)} = \boxed{\sec(x)}$

$\cos(x)[\tan(x)+\cot(x)]$

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

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

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

$= \boxed{\csc(x)}$

$\star$ $\cos x \cdot (\csc x + \tan x) =$

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

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

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

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

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

$$= \boxed{\cot(x)\cos^2(x)}$$

$\star$ $\cot(\theta)\sec^2(\theta) - \cot(\theta)$

$$= \cot(\theta)(\sec^2\theta - 1)$$

$$= \cot(\theta)(\tan^2\theta)$$

$$= \frac{\cos\theta}{\sin\theta} \cdot \frac{\sin^2\theta}{\cos^2\theta} = \frac{\sin\theta}{\cos\theta}$$

$$= \boxed{\tan\theta}$$

☆ $\sin^2 t \cos^2 t (1 + \tan^2 t)$

$= \sin^2 t \cos^2 t \sec^2 t$

$= \sin^2 t \cos^2 t \dfrac{1}{\cos^2 t}$

$= \boxed{\sin^2 t}$

$\tan^2(x)+1=\sec^2(x)$ $\sin^2(x)+\cos^2(x)=1$ $1+\cot^2\theta=\csc^2\theta$

Simplifying Trig Expressions (more advanced)

See extra paper

Foil

$$[\sec(x)-\tan(x)][\sec(x)+\tan(x)]$$

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

Pyth Identity

$$\boxed{1}$$

$$\frac{\cot(x)+\tan(x)}{\csc^2(x)}$$

$$\boxed{\tan(x)}$$

Foil

$$[\csc(x)-\cot(x)][\csc(x)+\cot(x)]$$

$$\csc^2(x)-\cot^2(x)$$

Pyth Identity

$$\boxed{1}$$

$$\frac{\sec^2(x)}{\tan(x)+\cot(x)}$$

$$\boxed{\tan(x)}$$

$$[1-\cos(x)][\csc(x)+\cot(x)]$$

$$\csc(x)+\cot(x)-\cos(x)\csc(x)-\cos(x)\cot(x)$$

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

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

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

$$\boxed{2\tan(x)}$$

$$[\csc(x)-1][\sec(x)+\tan(x)]$$

$$\csc(x)\sec(x)+\csc(x)\tan(x)-\sec(x)-\tan(x)$$

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

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

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

$$=\frac{1-\sin^2(x)}{\sin(x)\cos(x)}=\frac{\cos^2(x)}{\sin(x)\cos(x)}=\frac{\cos(x)}{\sin(x)}=\boxed{\cot(x)}$$

$$\frac{\cot(\theta)}{\csc(\theta)+1}+\frac{\cot(\theta)}{\csc(\theta)-1}$$

$$\boxed{2\sec\theta}$$

$$\boxed{\frac{\cot(x)+\tan(x)}{\csc^2(x)}}\quad \frac{\left[\dfrac{\cos(x)}{\sin(x)}+\dfrac{\sin(x)}{\cos(x)}\right]}{\dfrac{1}{\sin^2(x)}} = \frac{\left[\dfrac{\cos^2(x)+\sin^2(x)}{\sin(x)\cos(x)}\right]}{\left[\dfrac{1}{\sin^2(x)}\right]}$$

$$= \frac{1}{\sin(x)\cos(x)}\cdot\frac{\sin^2(x)}{1} = \frac{\sin(x)}{\cos(x)} = \boxed{\tan(x)}$$

$$\boxed{\frac{\sec^2(x)}{\tan(x)+\cot(x)}}\quad \frac{\left[\dfrac{1}{\cos^2(x)}\right]}{\dfrac{\sin x}{\cos x}+\dfrac{\cos x}{\sin x}} = \frac{\left[\dfrac{1}{\cos^2 x}\right]}{\dfrac{\sin^2(x)+\cos^2(x)}{\sin(x)\cos(x)}} = \frac{\left[\dfrac{1}{\cos^2(x)}\right]}{\left[\dfrac{1}{\sin(x)\cos(x)}\right]}$$

$$= \frac{1}{\cos^2(x)}\cdot\frac{\sin(x)\cos(x)}{1} = \frac{\sin(x)}{\cos(x)} = \boxed{\tan(x)}$$

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

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

(Don't forget... Distribute the negative!!)

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

$$\frac{\cot\theta}{\csc\theta+1} + \frac{\cot\theta}{\csc\theta-1} = \frac{\cot\theta[\csc\theta-1]}{\csc^2\theta-1} + \frac{\cot\theta[\csc\theta+1]}{\csc^2\theta-1}$$

$(\csc\theta-1)$ $(\csc\theta+1)$

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

$\leftarrow$ Pyth Identity $\rightarrow$

$$= \frac{2}{\sin\theta}\cdot\frac{\sin\theta}{\cos\theta} = \frac{2}{\cos\theta} = \boxed{2\sec\theta}$$