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

$\frac{1}{\cos x} - \frac{\sin x}{\cos x} \cdot \sin x = \frac{1}{\sec x}$

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

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

$\frac{\cos^2 x}{\cos x} = \frac{1}{\sec x}$

$\cos x = \frac{1}{\sec x}$

$\frac{1}{\sec x} = \frac{1}{\sec x}$

2. $\frac{1+\cos x}{\sin x} = \csc x + \cot x$

$\frac{1}{\sin x} + \frac{\cos x}{\sin x} = \csc x + \cot x$

$\csc x + \cot x = \csc x + \cot x$

3. $\frac{\sec\theta \sin\theta}{\tan\theta + \cot\theta} = \sin^2\theta$

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

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

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

$\sin^2\theta = \sin^2\theta$

4. $\frac{\sec\theta}{\cos\theta} - \frac{\tan\theta}{\cot\theta} = 1$

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

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

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

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

$$\frac{\cos^2\theta}{\cos^2\theta} = 1$$

$$1 = 1$$

5. $\cos^2 y - \sin^2 y = 1 - 2\sin^2 y$

$$1 - \sin^2 y - \sin^2 y = 1 - 2\sin^2 y$$

$$1 - 2\sin^2 y = 1 - 2\sin^2 y$$

6. $\csc^2\theta \tan^2\theta - 1 = \tan^2\theta$

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

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

$$\tan^2\theta + \frac{1}{\tan^2\theta}\tan^2\theta - 1 = \tan^2\theta$$

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

$$\tan^2\theta = \tan^2\theta$$

7. $\frac{\sec^2\theta}{\sec^2\theta - 1} = \csc^2\theta$

$$\frac{\sec^2\theta}{\tan^2\theta} = \csc^2\theta$$

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

$$\frac{1}{\sin^2\theta} = \csc^2\theta$$

$$\csc^2\theta = \csc^2\theta$$

8. $\tan^2 x \sin^2 x = \tan^2 x - \sin^2 x$

$(\sec^2 x - 1)\sin^2 x = \tan^2 x - \sin^2 x$

$\sec^2 x \sin^2 x - \sin^2 x = \tan^2 x - \sin^2 x$

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

$\tan^2 x - \sin^2 x = \tan^2 x - \sin^2 x$

9. $(\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2 = 2$

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

$\sin^2\theta + \cos^2\theta + \sin^2\theta + \cos^2\theta = 2$

$1 + 1 = 2$

$2 = 2$

10. $(\sin\theta + \cos\theta)(\tan\theta + \cot\theta) = \sec\theta + \csc\theta$

$\sin\theta\tan\theta + \sin\theta\cot\theta + \cos\theta\tan\theta + \cos\theta\cot\theta = \sec\theta + \csc\theta$

$\sin\theta\left(\frac{\sin\theta}{\cos\theta}\right) + \sin\theta\left(\frac{\cos\theta}{\sin\theta}\right) + \cos\theta\left(\frac{\sin\theta}{\cos\theta}\right) + \cos\theta\left(\frac{\cos\theta}{\sin\theta}\right) = \sec\theta + \csc\theta$

$\frac{\sin^2\theta}{\cos\theta} + \cos\theta + \sin\theta + \frac{\cos^2\theta}{\sin\theta} = \sec\theta + \csc\theta$

$\frac{\sin^2\theta + \cos^2\theta}{\cos\theta} + \frac{\sin^2\theta + \cos^2\theta}{\sin\theta} = \sec\theta + \csc\theta$

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

$\sec\theta + \csc\theta = \sec\theta + \csc\theta$

★

11. $\frac{\tan\theta - 1}{\tan\theta + 1} = \frac{1 - \cot\theta}{1 + \cot\theta}$

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

★ manipulate both sides

$\frac{\sin\theta - \cos\theta}{\cos\theta} \cdot \frac{\cos\theta}{\sin\theta + \cos\theta} = \frac{\sin\theta - \cos\theta}{\sin\theta} \cdot \frac{\sin\theta}{\sin\theta + \cos\theta}$

$\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} = \frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$

12. $\frac{1-\tan^2 x}{1+\tan^2 x} = 1-2\sin^2 x$

$\frac{1-\tan^2 x}{\sec^2 x} = 1-2\sin^2 x$

$\frac{1}{\sec^2 x} - \frac{\tan^2 x}{\sec^2 x} = 1-2\sin^2 x$

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

$\cos^2 x - \sin^2 x = 1-2\sin^2 x$

$(1-\sin^2 x) - \sin^2 x = 1-2\sin^2 x$

$1-2\sin^2 x = 1-2\sin^2 x$

13. $\frac{\cos x+1}{\sin^3 x} = \frac{\csc x}{1-\cos x}$

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

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

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

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

$\frac{1}{\sin x} \cdot \frac{1}{1-\cos x} = \frac{\csc x}{1-\cos x}$

$\csc x \cdot \frac{1}{1-\cos x} = \frac{\csc x}{1-\cos x}$

$\frac{\csc x}{1-\cos x} = \frac{\csc x}{1-\cos x}$

14. $\csc^4 x - \cot^4 x = \csc^2 x + \cot^2 x$

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

$\csc^2 x + \cot^2 x = \csc^2 x + \cot^2 x$

15. $\dfrac{\tan\theta}{\sec\theta} + \dfrac{\cot\theta}{\csc\theta} = \sin\theta + \cos\theta$

$\dfrac{\sin\theta}{\cos\theta} \cdot \dfrac{\cos\theta}{1} + \dfrac{\cos\theta}{\sin\theta} \cdot \dfrac{\sin\theta}{1} = \sin\theta + \cos\theta$

$\sin\theta + \cos\theta = \sin\theta + \cos\theta$

16. $\dfrac{\sin y + \tan y}{1 + \sec y} = \sin y$

$\dfrac{\sin y + \dfrac{\sin y}{\cos y}}{1 + \dfrac{1}{\cos y}} = \sin y$

$\dfrac{\dfrac{\sin y \cos y + \sin y}{\cos y}}{\dfrac{\cos y + 1}{\cos y}} = \sin y$

$\dfrac{\sin y \cos y + \sin y}{\cos y} \cdot \dfrac{\cos y}{1 + \cos y} = \sin y$

$\dfrac{\sin y (\cos y + 1)}{1 + \cos y} = \sin y$

$\sin y = \sin y$