

1.

$$\begin{aligned} & \csc x \sin x + \cos x \\ & \frac{1}{\sin x} \sin x + \cos x \\ & \frac{\sin x}{\sin x} + \frac{\cos x}{\sin x} \\ & 1 + \cot x \end{aligned}$$

3.

$$\begin{aligned} & \frac{\sin x + \cos x}{\sin x} - \frac{\cos x - \sin x}{\cos x} \\ & \left(\frac{\cos x}{\cos x} \right) \left(\frac{\sin x + \cos x}{\sin x} \right) - \left(\frac{\cos x - \sin x}{\cos x} \right) \left(\frac{\sin x}{\sin x} \right) \\ & \frac{\cos x \sin x + \cos^2 x - \cos x \sin x + \sin^2 x}{\cos x \sin x} \\ & \frac{\cos^2 x + \sin^2 x}{\cos x \sin x} \\ & \frac{1}{\cos x \sin x} \\ & \frac{1}{\cos x} \left(\frac{1}{\sin x} \right) \\ & \sec x \csc x \end{aligned}$$

4.

$$\begin{aligned} & \tan \theta \csc \theta = \sec \theta \\ & \frac{\sin \theta}{\cos \theta} \left(\frac{1}{\sin \theta} \right) \\ & \frac{1}{\cos \theta} \\ & \sec \theta \end{aligned}$$

2.

$$\begin{aligned} & \sin^2 x + \sin^2 x \cot^2 x \\ & \sin^2 x (1 + \cot^2 x) \\ & \sin^2 x \csc^2 x \\ & \sin^2 x \left(\frac{1}{\sin^2 x} \right) \\ & 1 \end{aligned}$$

5.

$$\begin{aligned} & 1 + \tan^2 u - 1 - \sin^2 u = 1 \\ & 1 - \sin^2 u + \tan^2 u - \tan^2 u \sin^2 u = 1 \\ & \cos^2 u + \tan^2 u - 1 - \sin^2 u = 1 \\ & \cos^2 u + \tan^2 u \cos^2 u = 1 \\ & \cos^2 u (1 + \tan^2 u) = 1 \\ & \cos^2 u \sec^2 u = 1 \\ & \cos^2 u \left(\frac{1}{\cos^2 u} \right) = 1 \end{aligned}$$

6.

$$1 + \sec^2 x \sin^2 x = \sec^2 x$$

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

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

$$1 + \tan^2 x = \sec^2 x$$

$$\sec^2 x = \sec^2 x$$

7.

$$\cos\left(\frac{3\pi}{2} - \theta\right) = -\sin \theta$$

$$\cos \frac{3\pi}{2} \cos \theta + \sin \frac{3\pi}{2} \sin \theta = -\sin \theta$$

$$(0) \cos \theta + -1 \sin \theta = -\sin \theta$$

$$-\sin \theta = -\sin \theta$$

8.

$$\frac{\cos \alpha + \beta}{\cos \alpha \sin \beta} = \cot \beta - \tan \alpha$$

$$\frac{\cos \alpha \cos \beta - \sin \alpha \sin \beta}{\cos \alpha \sin \beta} = \cot \beta - \tan \alpha$$

$$\frac{\cos \alpha \cos \beta}{\cos \alpha \sin \beta} - \frac{\sin \alpha \sin \beta}{\cos \alpha \sin \beta} = \cot \beta - \tan \alpha$$

$$\frac{\cos \beta}{\sin \beta} - \frac{\sin \alpha}{\cos \alpha} = \cot \beta - \tan \alpha$$

$$\cot \beta - \tan \alpha = \cot \beta - \tan \alpha$$

9.

$$\sin \alpha - \beta \cos \alpha + \beta = \sin \alpha \cos \alpha - \sin \beta \cos \beta$$

$$(\sin \alpha \cos \beta - \sin \beta \cos \alpha)(\cos \alpha \cos \beta - \sin \alpha \sin \beta) = \sin \alpha \cos \alpha - \sin \beta \cos \beta$$

$$\sin \alpha \cos \alpha \cos^2 \beta - \sin^2 \alpha \sin \beta \cos \beta - \cos^2 \alpha \sin \beta \cos \beta + \sin \alpha \cos \alpha \sin^2 \beta$$

$$\sin \alpha \cos \alpha \cos^2 \beta + \cos \alpha \sin \alpha \sin^2 \beta - \sin \beta \cos \beta \sin^2 \alpha - \sin \beta \cos \beta \cos^2 \alpha$$

$$\sin \alpha \cos \alpha (\cos^2 \beta + \sin^2 \beta) - \sin \beta \cos \beta (\sin^2 \alpha + \cos^2 \alpha)$$

$$\sin \alpha \cos \alpha - \sin \beta \cos \beta$$

