

1. $\frac{\tan \alpha \csc \alpha}{\sec \alpha}$

$$\frac{\frac{\sin \alpha}{\cos \alpha} \cdot \frac{1}{\sin \alpha}}{\frac{1}{\cos \alpha}} = \frac{\frac{1}{\cos \alpha}}{\frac{1}{\cos \alpha}} = 1$$

2. $\cos \alpha \tan \alpha \csc \alpha$

$$\cos \alpha \left(\frac{\sin \alpha}{\cos \alpha} \right) \left(\frac{1}{\sin \alpha} \right)$$

$$1$$

3. $\tan x \cos^2 x$

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

$$\sin x \cos x$$

4. $\sin \theta \cot \theta$

$$\sin \theta \left(\frac{\cos \theta}{\sin \theta} \right)$$

$$\cos \theta$$

5. $\frac{\tan \beta}{\cot \beta}$

$$\frac{\sin \beta}{\cos \beta} \div \frac{\cos \beta}{\sin \beta}$$

$$\frac{\sin^2 \beta}{\cos^2 \beta} = \tan^2 \beta$$

6. $\frac{\cos \beta}{\sec \beta - \tan \beta}$

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

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

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

7. $\frac{1}{\sin^2 x} - \frac{\cos^2 x}{\sin^2 x}$

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

8. $\frac{\cos^2 \alpha}{1 - \sin \alpha}$

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

$$1 + \sin \alpha$$

9. $\frac{\csc x}{1 + \cot^2 x}$

$$\frac{\csc x}{\csc^2 x}$$

$$= \frac{1}{\csc x} = \sin x$$

10. $\sin^2 \theta \cos^2 \theta + \sin^4 \theta$

$$\sin^2 \theta (\cos^2 \theta + \sin^2 \theta)$$

$$\sin^2 \theta$$

11. $\sin x + \cos x \tan x$

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

$$2 \sin x$$

12. $(1 - \sin x)(1 + \sin x)$

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

13. $\sin^4 x + 2 \sin^2 x \cos^2 x + \cos^4 x$
 $(\sin^2 x + \cos^2 x)^2$

$$1^2$$

$$1$$

consider writing in terms of csc

14. $2 \csc^2 \alpha - \csc^4 \alpha + \cot^4 \alpha$

$$2 \csc^2 \alpha - \csc^4 \alpha + (\cot^2 \alpha)^2$$

$$2 \csc^2 \alpha - \csc^4 \alpha + (\csc^2 \alpha - 1)^2$$

$$2 \csc^2 \alpha - \csc^4 \alpha + \csc^4 \alpha - 2 \csc^2 \alpha + 1$$

$$1$$