

$$11. \frac{\sec^2 \sigma}{\tan \sigma} = \sec \sigma \csc \sigma$$

$$\downarrow$$

$$\sec^2 \sigma \cdot \frac{1}{\tan \sigma} = \sec \sigma \cdot \sec \sigma \cdot \cot \sigma$$

$$\sec \sigma \cdot \frac{1}{\cos \sigma} \cdot \frac{\cos \sigma}{\sin \sigma} = \sec \sigma \cdot \frac{1}{\sin \sigma}$$

$$\downarrow$$

$$= \sec \sigma \cdot \csc \sigma$$

$$12. \frac{\cot^3 \alpha}{\csc \alpha} = \cos \alpha (\csc^2 \alpha - 1) = \cos \alpha \cdot \cot^2 \alpha$$

$$\cot^3 \alpha \cdot \frac{1}{\csc \alpha} = \frac{\cos^3 \alpha}{\sin^3 \alpha} \cdot \frac{1}{\frac{1}{\cos \alpha}} = \frac{\cos^3 \alpha}{\sin^3 \alpha} \cdot \sin \alpha = \frac{\cos^3 \alpha}{\sin^2 \alpha} = \cos \alpha \cdot \frac{\cos^2 \alpha}{\sin^2 \alpha}$$

$$\cos \alpha (\csc^2 \alpha - 1) = \cos \alpha \cdot \cot^2 \alpha$$

$$13. \frac{\cot^2 \mu}{\csc \mu} = \csc \mu - \sin \mu$$

$$14. \frac{1}{\sin x} - \sin x = \frac{\cos^2 x}{\sin x} = \frac{1 - \sin^2 x}{\sin x} = \frac{1}{\sin x} - \frac{\sin^2 x}{\sin x} = \frac{1}{\sin x} - \sin x$$

$$15. \sec^6 x (\sec x \tan x) - \sec^4 x (\sec x \tan x) = \sec^5 x \tan^3 x$$

$$\sec^4 x (\sec^2 x (\sec x \tan x) - (\sec x \tan x)) = \sec^4 x ((\sec x \tan x)(\sec^2 x - 1))$$

$$\sec^5 x \tan^3 x \leftarrow = \sec^4 x \cdot \sec x \tan x \cdot \tan^2 x$$

$$16. \frac{1}{\sec x \tan x} = \csc x - \sin x$$

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

$$\downarrow$$

$$\csc x - \sin x \leftarrow \frac{1}{\sin x} - \sin x$$

Extra Credit: $\sin^{\frac{1}{2}} \phi \cos \phi - \sin^{\frac{5}{2}} \phi \cos \phi = \cos^3 \phi \sqrt{\sin \phi}$