

$$1. \cos x \tan x = \cos x \cdot \frac{\sin x}{\cos x} = \sin x$$

$$3. \sec^2 x - \tan^2 x = \frac{1}{\cos^2 x} - \frac{\sin^2 x}{\cos^2 x} = \frac{1 - \sin^2 x}{\cos^2 x} = \frac{\cos^2 x}{\cos^2 x} = 1$$

$$5. \cos u + \tan u \sin u = \cos u + \frac{\sin u}{\cos u} \sin u = \frac{\cos^2 u}{\cos u} + \frac{\sin^2 u}{\cos u} = \frac{1}{\cos u} = \sec u$$

$$7. \frac{\cos x \sec x}{\cot x} = \frac{\cos x \frac{1}{\cos x}}{\cot x} = \frac{1}{\cot x} = \tan x$$

$$9. \frac{1 + \sin y}{1 + \csc y} = \frac{1 + \sin y}{1 + \frac{1}{\sin y}} = \frac{1 + \sin y}{\frac{\sin y + 1}{\sin y}} = \frac{1 + \sin y}{1} \cdot \frac{\sin y}{\sin y + 1} = \sin y$$

$$11. \frac{\sec^2 x - 1}{\sec^2 x} = \frac{\tan^2 x}{\sec^2 x} = \frac{\sin^2 x}{\cos^2 x} \cdot \cos^2 x = \sin^2 x$$

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

$$13. \frac{1 + \csc x}{\cos x + \cot x} = \frac{1 + \frac{1}{\sin x}}{\cos x + \frac{\cos x}{\sin x}} = \frac{1 + \frac{1}{\sin x}}{\cos x + \frac{\cos x}{\sin x}} \cdot \frac{\sin x}{\sin x} = \frac{\sin x + 1}{\cos x(\sin x + 1)} = \frac{1}{\cos x} = \sec x$$

$$15. \frac{1 + \sin u}{\cos u} + \frac{\cos u}{1 + \sin u} = \frac{(1 + \sin u)^2 + \cos^2 u}{\cos u(1 + \sin u)} = \frac{1 + 2 \sin u + \sin^2 u + \cos^2 u}{\cos u(1 + \sin u)} = \frac{1 + 2 \sin u + 1}{\cos u(1 + \sin u)}$$

$$= \frac{2 + 2 \sin u}{\cos u(1 + \sin u)} = \frac{2(1 + \sin u)}{\cos u(1 + \sin u)} = \frac{2}{\cos u} = 2 \sec u$$

$$17. \frac{2 + \tan^2 x}{\sec^2 x} - 1 = \frac{1 + 1 + \tan^2 x}{\sec^2 x} - 1 = \frac{1}{\sec^2 x} + \frac{1 + \tan^2 x}{\sec^2 x} - 1 = \frac{1}{\sec^2 x} + \frac{\sec^2 x}{\sec^2 x} - 1$$

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

$$19. \tan \theta + \cos(-\theta) + \tan(-\theta) = \tan \theta + \cos \theta - \tan \theta = \cos \theta$$

$$21. \sin \theta \cot \theta = \sin \theta \frac{\cos \theta}{\sin \theta} = \cos \theta$$

$$23. \frac{\cos u \sec u}{\tan u} = \cos u \frac{1}{\cos u} \cot u = \cot u$$

$$25. \frac{\tan y}{\csc y} = \frac{\sin y}{\cos y} \sin y = \frac{\sin^2 y}{\cos y} = \frac{1 - \cos^2 y}{\cos y} = \sec y - \cos y$$

$$27. \sin B + \cos B \cot B = \sin B + \cos B \frac{\cos B}{\sin B} = \frac{\sin^2 B + \cos^2 B}{\sin B} = \frac{1}{\sin B} = \csc B$$