

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

$$2. \cos x \csc x \tan x \\ \frac{\cos x \cdot 1}{1 \sin x} \cdot \frac{\sin x}{\cos x} = 1$$

$$3. \tan x \cot x \\ \frac{\tan x \cdot 1}{1 \tan x} = 1$$

$$4. \sec x \cot x \\ \frac{1}{\cos x} \cdot \frac{\cos x}{\sin x} = \frac{1}{\sin x} = \csc x$$

$$5. \sin x \cos x \sec x \cot x \\ \frac{\sin x \cos x}{1 \cdot 1} \cdot \frac{1}{\cos x} \cdot \frac{\cos x}{\sin x} = \cos x$$

$$6. \cot x \sec x \\ \frac{\cos x}{\sin x} \cdot \frac{1}{\cos x} = \frac{1}{\sin x} = \csc x$$

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

$$8. \cos x \tan x \\ \frac{\cos x \cdot \sin x}{1 \cos x} = \sin x$$

$$9. \sin x \sec x \\ \frac{\sin x \cdot 1}{1 \cos x} = \frac{\sin x}{\cos x} = \tan x$$

10) $\csc x \sin x$
 $\frac{1}{\sin x} \cdot \sin x = 1$

11. $\cos x \tan x + \sin x \cot x$
 $\frac{\cos x \cdot \sin x}{1} + \sin x \cdot \frac{\cos x}{\sin x}$
 $\sin x + \cos x$

12. $\sin x \sec x \cot x$
 $\frac{\sin x \cdot 1}{1} \cdot \frac{\cos x}{\sin x} = 1$

13. $\sin x (\csc x - \sin x)$
 $\sin x \csc x - \sin^2 x$
 $\frac{\sin x \cdot 1}{\sin x} - \sin^2 x$
 $1 - \sin^2 x$
 $\cos^2 x$

14. $\cot x (\cos x \tan x + \sin x)$
 $\cot x \cos x \tan x + \cot x \sin x$
 $\frac{\cos x \cdot \cos x \cdot \sin x}{\sin x \cdot 1 \cdot \cos x} + \frac{\cos x \cdot \sin x}{\sin x \cdot 1}$
 $= \cos x + \cos x$
 $= 2 \cos x$

15. $\sec x \cot x - \cot x \cos x$
 $\left(\frac{1}{\cos x}\right) \left(\frac{\cos x}{\sin x}\right) - \left(\frac{\cos x}{\sin x}\right) \left(\frac{\cos x}{1}\right)$
 $\frac{1 - \cos^2 x}{\sin^2 x} = \frac{\sin^2 x}{\sin^2 x}$

16. $\sin x \tan x - \csc x \tan x$

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

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

17. $\tan x \div \sin x$

$$\tan x \cdot \frac{1}{\sin x}$$

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

18. $\cot x \div \csc x$

$$\cot x \cdot \frac{1}{\csc x}$$

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

19. $\sec x \div \csc x$

$$\sec x \cdot \frac{1}{\csc x}$$

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

20. $\csc x \div \cot x$

$$\csc x \cdot \frac{1}{\cot x}$$

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

21. $\sec x \div \tan x$
 $\sec x \cdot \frac{1}{\tan x}$

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

22. $\cot x \div \cos x$
 $\cot x \cdot \frac{1}{\cos x}$

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

23. $\tan x \div \sin x$
 $\tan x \cdot \frac{1}{\sin x}$

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

24. $\csc^2 x \div \sec^2 x$
 $\csc^2 x \cdot \frac{1}{\sec^2 x}$

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

25. $\tan^2 x \div \sec^2 x$
 $\tan^2 x \cdot \frac{1}{\sec^2 x}$

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

26. $\sec x \cdot \sin x \div \tan x$
 $\sec x \cdot \sin x \cdot \frac{1}{\tan x}$

$\frac{1}{\cancel{\cos x}} \cdot \cancel{\sin x} \cdot \frac{\cancel{\sin x}}{\cancel{\cos x}} = \frac{\cos x}{\sin x} = \cot x$

$$27. \sec^2 x - 1 = \tan^2 x$$

$$28. 1 + \tan^2 x = \sec^2 x$$

$$29. 1 + \cot^2 x = \csc^2 x$$

$$30. 2(\csc^2 x - \cot^2 x)$$

$$2(1) = 2$$

$$31. \sin x (1 + \cot^2 x)$$

$$\sin x + \sin x \cdot \cot^2 x$$

$$\sin x + \frac{\sin x \cdot \cos x}{1 \cdot \cancel{\sin x}}$$

$$\sin x + \cos x$$

$$32. \cot^2 x (\sec^2 x - 1)$$

$$\cot^2 x (\tan^2 x)$$

$$\cancel{\cot^2 x} \cdot \frac{1}{\cancel{\cot^2 x}} = 1$$

$$33. \frac{1 - \cos^2 x}{\sin^2 x}$$

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

$$= 1$$

$$34. \frac{1 - \sin^2 x}{\sin^2 x} = \frac{\cos^2 x}{\sin^2 x} = \cot^2 x$$

$$35. \cos x (\sec x - \cos x)$$

$$\cos x \sec x - \cos^2 x$$

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

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

(6)

$$36. \cot x (\tan x + \cot x)$$

$$\cot x \tan x + \cot^2 x$$

$$\cot x \cdot \frac{1}{\cot x} + \cot^2 x$$

$$1 + \cot^2 x$$

$$= \csc^2 x$$

$$37. \csc x - \cot x \cos x$$

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

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

$$= \sin x$$

$$38. \frac{\csc x \tan x}{1 + \tan^2 x}$$

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

$$\csc x \tan x \div \sec^2 x$$

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

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

$$39. \frac{\sin^2 x + \cos^2 x}{\tan^2 x + 1}$$

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

$$40. \frac{(1 + \sin x)(1 - \sin x)}{1 - \sin x + \sin x - \sin^2 x}$$

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

$$41. \frac{1 + \tan^2 x}{1 + \cot^2 x} = \frac{\sec^2 x}{\csc^2 x}$$

$$= \sec^2 x \div \csc^2 x$$

$$= \frac{\sec^2 x \cdot 1}{1 \cdot \csc^2 x}$$

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

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

$$= \boxed{\tan^2 x}$$

$$42. \frac{1}{1 + \tan^2 x} + \frac{1}{1 + \cot^2 x}$$

$$\frac{1}{\sec^2 x} + \frac{1}{\csc^2 x}$$

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

$$= 1$$

$$43. \frac{\tan x + \cot x}{\sec^2 x}$$

$$\tan x + \cot x \div \sec^2 x$$
$$\left(\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \right) \cdot \frac{1}{\sec^2 x}$$

$$\left(\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \right) \cdot \cos^2 x$$

$$\frac{\cos^2 x \sin x}{\cos x} + \frac{\cos x \cos^2 x}{\sin x}$$

$$\frac{\cos x \sin x + \cos^3 x}{\sin x}$$

$$44. \frac{\sec^2 x}{\sec^2 x - 1} \cdot \frac{\sec^2 x}{\tan^2 x}$$

$$\sec^2 x \div \tan^2 x$$
$$\frac{\sec^2 x}{1} \cdot \frac{1}{\tan^2 x}$$

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

$$45) \frac{\sec x \tan x}{\tan^2 x + 1}$$

$$\cancel{\sec x} \tan x \div \sec^2 x$$

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

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

$$46. \csc^2 x \tan^2 x - 1$$
$$\frac{1 \cdot \sin^2 x - 1}{\sin^2 x \cos^2 x}$$
$$\frac{1}{\cos^2 x} - 1$$

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

$$47. \tan^2 x \sin^2 x$$
$$\frac{\sin^2 x \cdot \sin^2 x}{\cos^2 x \cdot 1}$$
$$\frac{\sin^4 x}{\cos^2 x}$$

$$48. \csc^2 x - 1 = \cot^2 x$$

$$49. \sec^2 x - \tan^2 x = 1$$

$$50. \frac{\sec^2 x - 1}{\sin^2 x} = \frac{\tan^2 x}{\sin^2 x}$$

$$\tan^2 x \div \sin^2 x$$

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

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

$$51) \frac{\sec^2 x (1 - \sin^2 x)}{\sec^2 x (\cos^2 x)} = \frac{1}{\cancel{\cos^2 x} (\cancel{\cos^2 x})} = 1$$

$$52) \frac{\tan^2 x + 1}{\tan^2 x} = \frac{\sec^2 x}{\tan^2 x}$$

$$\begin{aligned} & \sec^2 x \div \tan^2 x \\ & \sec^2 x \cdot \frac{1}{\tan^2 x} \\ & \frac{1}{\cos^2 x} \cdot \frac{\cos^2 x}{\sin^2 x} \\ & \frac{1}{\sin^2 x} = \csc^2 x \end{aligned}$$

$$53) \frac{1}{\tan^2 x + 1} = \frac{1}{\sec^2 x} = \cos^2 x$$

$$54) \frac{1 - \sec^2 x}{\tan^2 x} = \frac{\tan^2 x}{\tan^2 x} = 1$$

$$55) \frac{\sin^2 x + \cos^2 x}{\tan^2 x + 1} = \frac{1}{\tan^2 x + 1} = \frac{1}{\sec^2 x} = \cos^2 x$$

$$56) \frac{\sin x}{1 - \cos^2 x} = \frac{\sin x}{\sin^2 x} = \frac{1}{\sin x} = \csc x$$