Trigonometric Identities

Prove the following identities:

1. $\cot x = \csc x \cos x$

2. $\cot x \sin x = \cos x$

3. $\dfrac{\tan x}{\sec x} = \sin x$

4. $\tan x \cos x = \sin x$

5. $\dfrac{\cot x}{\csc x} = \cos x$

6. $\sin x \sec x = \tan x$

7. $\tan x \csc x = \sec x$

8. $\sec x(1 + \cos x) = 1 + \sec x$

9. $\sin x(1 + \csc x) = \sin x + 1$

10. $\tan x(1 + \cot x) = 1 + \tan x$

11. $\cos x(\sec x + 1) = \cos x + 1$

12. $\csc y(\sin y - 1) = 1 - \csc y$

13. $\cot z(1 - \tan z) = \cot z - 1$

14. $\sin y \tan^2 y \cot^3 y = \cos y$

15. $\sin^2 x \sec^2 x = \sec^2 x - 1$

16. $(1 + \tan^2 x)\cos^2 x = 1$

17. $(1 + \tan y)^2 - \sec^2 y = 2\tan y$

18. $(\cos x - \sin x)^2 = 1 - 2\sin x \cos x$

19. $(\sin y + \cos y)(\sin y - \cos y) = 1 - 2\cos^2 y$

20. $\dfrac{\tan^2 x - 1}{\cot^2 x - 1} = 1 - \sec^2 x$

21. $\dfrac{1}{1 + \tan^2 y} + \dfrac{1}{1 + \cot^2 y} = 1$

22. $\dfrac{\tan^2 z}{1 + \tan^2 z} = \sin^2 z$

23. $\dfrac{1 + \cos x}{1 - \cos x} = 1 + \dfrac{2\cos x(1 + \cos x)}{\sin^2 x}$

24. $\dfrac{\sec z}{\csc^2 z} = \sec z - \cos z$

25. $\csc^2 y - \csc y \cot y = \dfrac{1}{1 + \cos y}$

26. $\dfrac{1 + \sin^2 x \sec^2 x}{1 + \cos^2 x \csc^2 x} = \sin^2 x \sec^2 x$

27. $2 + \dfrac{\sin^4 y + \cos^4 y}{\sin^2 y \cos^2 y} = \sec^2 y \csc^2 y$

28. $(1 + \tan^2 z)\cos^2 z = 1$

29. $(1 - \cos^2 x)(1 + \tan^2 x) = \tan^2 x$

30. $\sin^2 x \sec^2 x = \sec^2 x - 1$

31. $\dfrac{\sin y + \cos y}{\sec y + \csc y} = \dfrac{\cos y}{\csc y}$

32. $\cos t + \sin t = \dfrac{1 + \tan t}{\sec t}$

33. $\dfrac{1}{1 - \sec x} + \dfrac{1}{1 + \sec x} = -2\cot^2 x$

34. $\dfrac{(\sin x + \cos x)^2}{(\sin x - \cos x)^2} = \dfrac{\sec^2 x + 2\tan x}{\sec^2 x - 2\tan x}$