5-2 Verifying Trigonometric Identities

Verify each identity.

1. $(\sec^2 \theta - 1) \cos^2 \theta = \sin^2 \theta$

2. $\sec^2 \theta (1 - \cos^2 \theta) = \tan^2 \theta$

3. $\sin \theta - \sin \theta \cos^2 \theta = \sin^3 \theta$

4. $\csc \theta - \cos \theta \cot \theta = \sin \theta$

5. $\cot^2 \theta \csc^2 \theta - \cot^2 \theta = \cot^4 \theta$

6. $\tan \theta \csc^2 \theta - \tan \theta = \cot \theta$

7. $\dfrac{\sec \theta}{\sin \theta} - \dfrac{\sin \theta}{\cos \theta} = \cot \theta$

8. $\dfrac{\sin \theta}{1 - \cos \theta} + \dfrac{1 - \cos \theta}{\sin \theta} = 2 \csc \theta$

9. $\dfrac{\cos \theta}{1 + \sin \theta} + \tan \theta = \sec \theta$

10. $\dfrac{\sin \theta}{1 - \cot \theta} + \dfrac{\cos \theta}{1 - \tan \theta} = \sin \theta + \cos \theta$

11. $\dfrac{1}{1 - \tan^2 \theta} + \dfrac{1}{1 - \cot^2 \theta} = 1$

12. $\dfrac{1}{\csc \theta + 1} + \dfrac{1}{\csc \theta - 1} = 2 \sec^2 \theta \sin \theta$

13. $(\csc \theta - \cot \theta)(\csc \theta + \cot \theta) = 1$

14. $\cos^4 \theta - \sin^4 \theta = \cos^2 \theta - \sin^2 \theta$

15. $\dfrac{1}{1 - \sin \theta} + \dfrac{1}{1 + \sin \theta} = 2 \sec^2 \theta$

16. $\dfrac{\cos \theta}{1 + \sin \theta} + \dfrac{\cos \theta}{1 - \sin \theta} = 2 \sec \theta$

17. $\csc^4 \theta - \cot^4 \theta = 2 \cot^2 \theta + 1$

18. $\dfrac{\csc^2 \theta + 2 \csc \theta - 3}{\csc^2 \theta - 1} = \dfrac{\csc \theta + 3}{\csc \theta + 1}$

Verify each identity.

20. $(\csc \theta + \cot \theta)(1 - \cos \theta) = \sin \theta$

21. $\sin^2 \theta \tan^2 \theta = \tan^2 \theta - \sin^2 \theta$

22. $\dfrac{1 - \tan^2 \theta}{1 - \cot^2 \theta} = \dfrac{\cos^2 \theta - 1}{\cos^2 \theta}$

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23. $\dfrac{1+\csc\theta}{\sec\theta} = \cos\theta + \cot\theta$

24. $(\csc\theta - \cot\theta)^2 = \dfrac{1-\cos\theta}{1+\cos\theta}$

25. $\dfrac{1+\tan^2\theta}{1-\tan^2\theta} = \dfrac{1}{2\cos^2\theta - 1}$

26. $\tan^2\theta \cos^2\theta = 1 - \cos^2\theta$

27. $\sec\theta - \cos\theta = \tan\theta \sin\theta$

28. $1 - \tan^4\theta = 2\sec^2\theta - \sec^4\theta$

29. $(\csc\theta - \cot\theta)^2 = \dfrac{1-\cos\theta}{1+\cos\theta}$

30. $\dfrac{1+\tan\theta}{\sin\theta + \cos\theta} = \sec\theta$

31. $\dfrac{2+\csc\theta\sec\theta}{\csc\theta\sec\theta} = (\sin\theta + \cos\theta)^2$

Verify each identity.

44. $\sec^2\theta + \tan^2\theta = \sec^4\theta - \tan^4\theta$

45. $-2\cos^2\theta = \sin^4\theta - \cos^4\theta - 1$

46. $\sec^2\theta \sin^2\theta = \sec^4\theta - (\tan^4\theta + \sec^2\theta)$

47. $3\sec^2\theta \tan^2\theta + 1 = \sec^6\theta - \tan^6\theta$

48. $\sec^4 x = 1 + 2\tan^2 x + \tan^4 x$

49. $\sec^2 x \csc^2 x = \sec^2 x + \csc^2 x$