Verifying & Using Trigonometric Identities

Part A – Understanding Identities

1. Explain the difference between an identity and an equation.

2. Why can numerical or graphical verification support an identity but not prove it?

Part B – Graphical Verification

Use a graphing calculator to determine whether each equation appears to be an identity.

3. $\sin^2 x + \cos^2 x = 1$

4. $\tan x = \frac{\sin x}{\cos x}$

5. $\sin x + \cos x = 1$

Part C – Recognizing Identity Families

For each expression, identify the identity family that would be most useful. Choices: Reciprocal or Pythagorean.

6. $1 - \sin^2 \theta$

7. $\frac{1}{\cos \theta}$

8. $\csc^2 \theta - 1$

9. $\tan \theta \cdot \cot \theta$

10. $\sec^2 \theta - 1$

11. $1 - \cos^2 \theta$

Part D – Simplifying Using Identities

Simplify each expression.

12. $1 - \sin^2 \theta$

13. $\sec^2 \theta - 1$

14. $\tan \theta \cdot \cot \theta$

15. $\frac{1-\cos^2 \theta}{\sin \theta}$

16. $\frac{\sec^2 \theta - 1}{\tan \theta}$

17. $\frac{\cos \theta}{\sin \theta}$

18. $\csc^2 \theta - 1$

19. $\frac{1-\sin^2 \theta}{\cos \theta}$

Part E – Mixed Review

Simplify each expression using identities.

20. $\frac{\sin^2\theta+\cos^2\theta}{\sec\theta}$

21. $\frac{\tan^2\theta+1}{\sec\theta}$

22. $\frac{\sin\theta\cdot\csc\theta+\cos\theta\cdot\sec\theta}{2}$

23. $\frac{\csc^2\theta-1}{\cot\theta}$

24. $\frac{\sec^2\theta-1}{\sec\theta}$

25. $\frac{1-\cos^2\theta}{\sin^2\theta}$

26. $\frac{1-\sin^2\theta}{\cos^2\theta}$

27. $\frac{\tan\theta+\cot\theta}{\sec\theta\csc\theta}$

28. $\frac{\sin^2\theta+\cos^2\theta}{\tan\theta}$

29. $\frac{\sec^2\theta-\tan^2\theta}{\csc\theta}$

30. $\frac{\csc^2\theta-\cot^2\theta}{\sec\theta}$

31. $\frac{\cos\theta}{1-\sin\theta}$

32. $\frac{\sin^2\theta}{1-\cos\theta}$