

Simplifying Trig Expressions

Simplify each expression to a number or one trig function.

_____ 1. $(\sec \theta)(\cos \theta)$

_____ 2. $(\cot \theta)(\sin \theta)$

_____ 3. $1 + \tan^2 \theta$

_____ 4. $\sin^2 \theta + \cos^2 \theta$

_____ 5. $\frac{\tan \theta}{\sec \theta}$

_____ 6. $(\tan^2 \theta)(\csc^2 \theta)$

_____ 7. $(\sin \theta)(\tan \theta)(\cot \theta)(\csc \theta)$

_____ 8. $\frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta}$

_____ 9. $\sec \theta - \sin \theta \tan \theta$

_____ 10. $\frac{\sec^2 \theta - 1}{\sec^2 \theta}$

_____ 11. $\frac{\csc \theta}{\sin \theta} - \frac{\cot \theta}{\tan \theta}$

_____ 12. $\sec^2 \theta - \tan^2 \theta + \cot^2 \theta$

_____ 13. $\cos \theta \sec \theta - \frac{\cos \theta}{\sec \theta}$

_____ 14. $\frac{\sec^2 \theta}{\sec^2 \theta - 1}$

_____ 15. $\sin^4 \theta - \cos^4 \theta$

_____ 16. $\tan \theta \cot \theta - \cos^2 \theta$

_____ 17. $\frac{\sin \theta + \tan \theta}{1 + \sec \theta}$

_____ 18. $\frac{\tan \theta + \cot \theta}{\csc^2 \theta}$

_____ 19. $(1 + \cos \theta)(\csc \theta - \cot \theta)$

_____ 20. $(4 \cos \theta - 3 \sin \theta)^2 + (3 \cos \theta + 4 \sin \theta)^2$

Simplifying Trig Expressions KEY

Simplify each expression to a number or one trig function.

1 1. $(\sec \theta)(\cos \theta) = \left(\frac{1}{\cos \theta}\right)\left(\frac{\cos \theta}{1}\right)$

$\cos \theta$ 2. $(\cot \theta)(\sin \theta) = \left(\frac{\cos \theta}{\sin \theta}\right)\left(\frac{\sin \theta}{1}\right)$

$\sec^2 \theta$ 3. $1 + \tan^2 \theta$

1 4. $\sin^2 \theta + \cos^2 \theta$

$\sin \theta$ 5. $\frac{\tan \theta}{\sec \theta} = \frac{\frac{\sin \theta}{\cos \theta}}{\frac{1}{\cos \theta}} = \frac{\sin \theta}{\cos \theta} \cdot \frac{\cos \theta}{\cos \theta} = \frac{\sin \theta}{1} = \sin \theta$

$\sec^2 \theta$ 6. $(\tan^2 \theta)(\csc^2 \theta) = \left(\frac{\sin^2 \theta}{\cos^2 \theta}\right)\left(\frac{1}{\sin^2 \theta}\right)$

1 7. $(\sin \theta)(\tan \theta)(\cot \theta)(\csc \theta) = \left(\frac{\sin \theta}{1}\right)\left(\frac{\sin \theta}{\cos \theta}\right)\left(\frac{\cos \theta}{\sin \theta}\right)\left(\frac{1}{\sin \theta}\right)$

$\sec^2 \theta$ 8. $\frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta} = \frac{1}{\cos^2 \theta}$

$\cos \theta$ 9. $\sec \theta - \sin \theta \tan \theta = \frac{1}{\cos \theta} - \left(\frac{\sin \theta}{1}\right)\left(\frac{\sin \theta}{\cos \theta}\right) = \frac{1 - \sin^2 \theta}{\cos \theta} = \frac{\cos^2 \theta}{\cos \theta}$

$\sin^2 \theta$ 10. $\frac{\sec^2 \theta - 1}{\sec^2 \theta} = \frac{\tan^2 \theta}{\sec^2 \theta} = \frac{\frac{\sin^2 \theta}{\cos^2 \theta}}{\frac{1}{\cos^2 \theta}} = \frac{\sin^2 \theta}{\cos^2 \theta} \cdot \frac{\cos^2 \theta}{\cos^2 \theta} = \frac{\sin^2 \theta}{1} = \sin^2 \theta$

1 11. $\frac{\csc \theta}{\sin \theta} - \frac{\cot \theta}{\tan \theta} = \left(\frac{1}{\sin \theta}\right) - \left(\frac{\cos \theta}{\sin \theta}\right) = \left(\frac{1}{\sin \theta} \cdot \frac{\sin \theta}{\sin \theta}\right) - \left(\frac{\cos \theta}{\sin \theta} \cdot \frac{\sin \theta}{\sin \theta}\right) = \frac{1}{\sin^2 \theta} - \frac{\cos^2 \theta}{\sin^2 \theta} = \frac{1 - \cos^2 \theta}{\sin^2 \theta} = \frac{\sin^2 \theta}{\sin^2 \theta} = 1$

$\csc^2 \theta$ 12. $\sec^2 \theta - \tan^2 \theta + \cot^2 \theta = 1 + \cot^2 \theta$

$\sin^2 \theta$ 13. $\cos \theta \sec \theta - \frac{\cos \theta}{\sec \theta} = \left(\frac{\cos \theta}{1}\right)\left(\frac{1}{\cos \theta}\right) - \frac{\cos \theta}{\frac{1}{\cos \theta}} = 1 - \frac{\cos \theta \cdot \cos \theta}{\frac{1}{\cos \theta} \cdot \cos \theta} = 1 - \cos^2 \theta$

$\csc^2 \theta$ 14. $\frac{\sec^2 \theta}{\sec^2 \theta - 1} = \frac{\sec^2 \theta}{\tan^2 \theta} = \frac{\frac{1}{\cos^2 \theta}}{\frac{\sin^2 \theta}{\cos^2 \theta}} = \frac{1}{\sin^2 \theta} = \csc^2 \theta$

sin² θ - cos² θ 15. ^{FACTOR} $\sin^4 \theta - \cos^4 \theta = (\sin^2 \theta - \cos^2 \theta)(\sin^2 \theta + \cos^2 \theta) = (\sin^2 \theta - \cos^2 \theta)$ 

sin² θ 16. $\tan \theta \cot \theta - \cos^2 \theta = \left(\frac{\sin \theta}{\cos \theta}\right) \left(\frac{\cos \theta}{\sin \theta}\right) - \cos^2 \theta = 1 - \cos^2 \theta$ 

sin θ 17. $\frac{\sin \theta + \tan \theta}{1 + \sec \theta} = \frac{\sin \theta + \frac{\sin \theta}{\cos \theta}}{1 + \frac{1}{\cos \theta}} = \frac{\left(\frac{\sin \theta + \frac{\sin \theta}{\cos \theta}}{\cos \theta}\right) \cdot \cos \theta}{\left(1 + \frac{1}{\cos \theta}\right) \cdot \cos \theta} = \frac{\sin \theta \cos \theta + \sin \theta}{\cos \theta + 1} = \frac{\sin \theta (\cos \theta + 1)}{\cos \theta + 1}$ ^{FFO} ^{FACTOR}

tan θ 18. $\frac{\tan \theta + \cot \theta}{\csc^2 \theta} = \frac{\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}}{\frac{1}{\sin^2 \theta}} = \frac{\left(\frac{\sin \theta}{\cos \theta} \cdot \frac{\sin \theta}{\sin \theta} + \frac{\cos \theta}{\sin \theta} \cdot \frac{\cos \theta}{\cos \theta}\right)}{\frac{1}{\sin^2 \theta}} = \frac{\frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \cos \theta}}{\frac{1}{\sin^2 \theta}} = \frac{1}{\frac{\sin \theta \cos \theta}{\sin^2 \theta}} = \frac{1}{\frac{1}{\sin^2 \theta} \cdot \sin \theta \cos \theta} = \frac{1}{\frac{1}{\sin^2 \theta} \cdot \sin \theta \cos \theta} = \frac{1}{\frac{\cos \theta}{\sin \theta}}$ ^{FFO} ^{eyes} ^{FFO}

sin θ 19. $(1 + \cos \theta)(\csc \theta - \cot \theta) = \csc \theta - \cot \theta + \cos \theta \csc \theta - \cos \theta \cot \theta =$

$$= \frac{1}{\sin \theta} - \frac{\cos \theta}{\sin \theta} + \left(\frac{\cos \theta}{1} \cdot \frac{1}{\sin \theta}\right) - \left(\frac{\cos \theta}{1} \cdot \frac{\cos \theta}{\sin \theta}\right) = \frac{1 - \cos \theta + \cos \theta - \cos^2 \theta}{\sin \theta}$$

$$\begin{aligned} & \text{eyes} \\ &= \frac{1 - \cos^2 \theta}{\sin \theta} = \frac{\sin^2 \theta}{\sin \theta} \end{aligned}$$

25 20. ^{FOIL OR BOX} $(4 \cos \theta - 3 \sin \theta)^2 + (3 \cos \theta + 4 \sin \theta)^2$

$$= 16 \cos^2 \theta - 24 \cos \theta \sin \theta + 9 \sin^2 \theta + 9 \cos^2 \theta + 24 \cos \theta \sin \theta + 16 \sin^2 \theta$$

$$= 25 \cos^2 \theta - 25 \sin^2 \theta = 25(\cos^2 \theta - \sin^2 \theta)$$
 