Trigonometric Identities Formulas

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$1 + \cot^2\theta = \csc^2\theta$$

$$\tan^2\theta + 1 = \sec^2\theta$$

Reciprocal Identities

$$sin\theta = \frac{1}{csc\theta} \qquad csc\theta = \frac{1}{sin\theta}$$

$$cos\theta = \frac{1}{sec\theta} \qquad sec\theta = \frac{1}{cos\theta}$$

$$tan\theta = \frac{1}{cot\theta} \qquad cot\theta = \frac{1}{tan\theta}$$

Quotient Identities

$$tan\theta = \frac{sin\theta}{cos\theta} \qquad cot\theta = \frac{cos\theta}{sin\theta}$$

Sum and Difference Identities

$$\sin(\alpha \pm \beta) = sin\alpha cos\beta \pm cos\alpha sin\beta$$

$$\cos(\alpha \pm \beta) = cos\alpha cos\beta \mp sin\alpha sin\beta$$

$$tan(\alpha \pm \beta) = \frac{tan\alpha \pm tan\beta}{1 \mp tan\alpha tan\beta}$$

Double and Half Angle Formulas

$$sin2\theta = 2sin\theta cos\theta$$

$$cos2\theta = \cos^2\theta - \sin^2\theta$$

$$cos2\theta = 2\cos^2\theta - 1$$

$$cos2\theta = 1 - 2\sin^2\theta$$

$$tan2\theta = \frac{2tan\theta}{1 - \tan^2\theta}$$

$$sin\frac{\theta}{2} = \pm\sqrt{\frac{1 - cos\theta}{2}}$$

$$cos\frac{\theta}{2} = \pm\sqrt{\frac{1 + cos\theta}{2}}$$

$$tan\frac{\theta}{2} = \pm\sqrt{\frac{1 - cos\theta}{1 + cos\theta}}$$

GSE Precalculus Trig Identities Review Name: _____ Block: __

Given that α and β are in quadrant 4 and $\sin\alpha = -\frac{4}{5}$ and $\cos\beta = \frac{15}{17}$, find:

1. cos (α)

2. sin (β)

3. sin $(\alpha + \beta)$

4. cos $(\alpha - \beta)$

5. tan $(\alpha - \beta)$

6. sin (2α)

7. cos (2β)

8. tan (2β)

9. If $\sin\theta = \frac{1}{3}$ and $90° < \theta < 180°$, then find the value of $\sec\theta$

Use sum/difference formulas to find the exact value of the following:

10. $\sin 60° = \sin(90° - 30°)$

11. $\cos 75° = \cos(120° - 45°)$

Write as the sin, cos, or tan of a single angle.

12. $sin70^o cos40^o - cos70^o sin40^o$

13. $cos210^o cos80^o + sin210^o sin80^o$

Simplify the trig expression.

1. $\sin\theta \sec\theta$

2. $\frac{\sec x}{\csc x}$

3. $\cos^2\theta\,(1+\tan^2\theta)$

4. $\frac{\cos^2 y}{1+\sin y}$

5. $(\tan x)(\cos x)(\csc x)$

6. $\frac{\tan x+1}{\sec x}$

7. $1-(\sec^2 x-\tan^2 x)$

8. $\frac{\cot^2 x}{\csc x-1}$

9. $\frac{\sin x+\cos x}{\sin x\cos x}$

Verify the following.

1. $\sec\theta\cot\theta = \csc\theta$

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

7. $1+\sec^2\theta\sin^2\theta = \sec^2\theta$

4. $\frac{\csc\theta}{\sec\theta} + \frac{\cos\theta}{\sin\theta} = 2\cot\theta$

5. $\frac{\sec^2\theta}{\tan\theta} = \sec\theta\csc\theta$

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

Verify the following.

10. $\frac{\cos x \sec x}{\tan x} = \cot x$

12. $\tan \theta + \cot \theta = (\sec \theta)(\csc \theta)$

13. $(\sin x + \cos x)^2 = 1 + 2 \sin x \cos x$

14. $(\tan y + \cot y) \sin y \cos y = 1$

17. $\cos t + \tan t \sin t = \sec t$

Verify the following.

1. $\sec\theta \cot\theta = \csc\theta$

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

3. $\sin(x+y)+\sin(x-y)=2\sin x\cos y$

4. $\frac{\csc\theta}{\sec\theta}+\frac{\cos\theta}{\sin\theta}=2\cot\theta$

5. $\frac{\sec^2\theta}{\tan\theta}=\sec\theta\csc\theta$

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

7. $1+\sec^2\theta\sin^2\theta=\sec^2\theta$

8. $\frac{1}{1-\cos x}-\frac{1}{1+\cos x}=2\csc x\cot x$

9. $\frac{\sin^2\theta+5\sin\theta+6}{\sin^2\theta-4}=\frac{\sin\theta+3}{\sin\theta-2}$

10. $\sin x\,(1-2\cos^2 x+\cos^4 x)=\sin^5 x$

15. $\frac{\csc\theta-\cot\theta}{\sec\theta-1}=\cot\theta$

16. $\frac{\sin\theta-\csc\theta}{\cos\theta-\cot\theta}=\cot\theta$

11. $\frac{\cos\theta}{1-\sin\theta}=\sec\theta+\tan\theta$

3. $\sin(x+y)+\sin(x-y)=2\sin x\cos y$