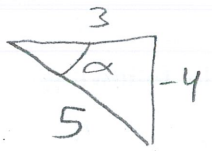
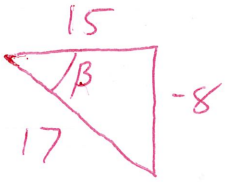
GSE PreCalculus: Unit 5: Trig Identities
Test 5A Review

Name _____
Date _____ **Day** _____

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



1. $\cos(\alpha)$ $3/5$



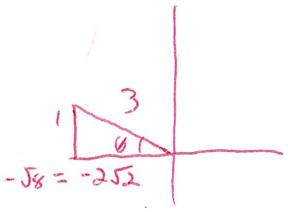
2. $\sin(\beta)$ $-8/17$

3. $\sin(\alpha+\beta)$ $\sin\alpha\cos\beta + \cos\alpha\sin\beta = -\frac{4}{5}\left(\frac{15}{17}\right) + \frac{3}{5}\left(\frac{-8}{17}\right) = \frac{-60}{85} + \frac{-24}{85} = \boxed{\frac{-84}{85}}$

4. $\cos(\alpha-\beta)$ $\cos\alpha\cos\beta + \sin\alpha\sin\beta = \frac{3}{5}\left(\frac{15}{17}\right) + \frac{-4}{5}\left(\frac{-8}{17}\right) = \frac{45}{85} + \frac{32}{85} = \boxed{\frac{77}{85}}$

5. $\cot(\alpha-\beta)$ $\frac{\cos(\alpha-\beta)}{\sin(\alpha-\beta)} = \frac{77/85}{\sin\alpha\cos\beta - \cos\alpha\sin\beta} = \frac{77/85}{-\frac{4}{5}\left(\frac{15}{17}\right) - \frac{3}{5}\left(\frac{-8}{17}\right)} = \frac{77/85}{\frac{-60}{85} - \frac{-24}{85}} = \frac{77/85}{-36/85} = \boxed{\frac{77}{-36}}$

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



$\cos\theta = \boxed{\frac{-2\sqrt{2}}{3}}$

$\sec\theta = \frac{3}{-2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{-3\sqrt{2}}{4}}$

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

1. $\sin 60° = \sin(90° - 30°)$ $\sin 90\cos 30 - \cos 90\sin 30 = 1\left(\frac{\sqrt{3}}{2}\right) - 0\left(\frac{1}{2}\right) = \boxed{\frac{\sqrt{3}}{2}}$

2. $\cos 75° = \cos(120° - 45°)$ $\cos 120\cos 45 + \sin 120\sin 45 = \left(\frac{-1}{2}\right)\left(\frac{\sqrt{2}}{2}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) = \frac{-\sqrt{2}}{4} + \frac{\sqrt{6}}{4}$

$\boxed{\frac{\sqrt{6}-\sqrt{2}}{4}}$

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

1. $\sin 70°\cos 40° - \cos 70°\sin 40°$ $\sin(70-40) = \sin 30°$

2. $\cos 210°\cos 80° + \sin 210°\sin 80°$ $\cos(210-80) = \cos 130°$

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Verify the following.

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

$\frac{1}{\cos\theta} \cdot \frac{\cos\theta}{\sin\theta} = \csc\theta$

$\frac{1}{\sin\theta} = \csc\theta \quad \csc\theta = \csc\theta$ ✓

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

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

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

$\cos^2\theta = \cos^2\theta$ ✓

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

$\sin x\cos y + \cos x\sin y + \sin x\cos y - \cos x\sin y = 2\sin x\cos y$

$\sin x\cos y + \sin x\cos y = 2\sin x\cos y$

$2\sin x\cos y = 2\sin x\cos y$

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

$\frac{1/\sin\theta}{1/\cos\theta} + \frac{\cos\theta}{\sin\theta} = 2\cot\theta$

$\frac{\cos\theta}{\sin\theta} + \frac{\cos\theta}{\sin\theta} = 2\cot\theta$

$\cot\theta + \cot\theta = 2\cot\theta \quad 2\cot\theta = 2\cot\theta$ ✓

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

$\frac{1/\cos^2\theta}{\sin\theta/\cos\theta} = \sec\theta\csc\theta$

$\frac{\cos\theta\sin\theta}{\cos^2\theta\sin\theta} = \sec\theta\csc\theta$

$\frac{1}{\cos\theta}\cdot\frac{1}{\sin\theta} = \sec\theta\csc\theta \quad \sec\theta\csc\theta = \sec\theta\csc\theta$ ✓

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

$\cos^2 x(\sec^2 x) = 1$

$\frac{\cos^2 x}{1}\cdot\frac{1}{\cos^2 x} = 1$

$1 = 1$ ✓

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

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

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

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

$\sec^2\theta = \sec^2\theta$ ✓

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

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

$\frac{2\cos x}{1-\cos^2 x} = 2\csc x\cot x$

$\frac{2\cos x}{\sin^2 x} = 2\csc x\cot x$

$2\cdot\frac{1}{\sin x}\cdot\frac{\cos x}{\sin x} = 2\csc x\cot x \quad 2\csc x\cot x = 2\csc x\cot x$ ✓

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

$\frac{(\sin\theta+2)(\sin\theta+3)}{(\sin\theta+2)(\sin\theta-2)} = \frac{\sin\theta+3}{\sin\theta-2}$

$\frac{\sin\theta+3}{\sin\theta-2} = \frac{\sin\theta+3}{\sin\theta-2}$ ✓

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

$\sin x(1-\cos^2 x)(1-\cos^2 x) = \sin^5 x$

$\sin x(\sin^2 x)(\sin^2 x) = \sin^5 x$

$\sin^5 x = \sin^5 x$ ✓