Unit 11 Corrective Assignment: Trig Identities

Pythagorean Identities

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

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

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

Half Angle Identities

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

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

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

Double Angle Formulas

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

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

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

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

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

NAME: _____

Sum/Difference Identities

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

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

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

Directions for 1: Simplify to a single trig ratio or number.

1) $\cos x \csc x$

Directions for 2-6: Prove the identity. SHOW WORK!

2) $\sin x(\csc x - \sin x) = cos^2\,x$

3) $\frac{1+tan^2\propto}{1+cot^2\propto} = tan^2\propto$

4) $\frac{tan^2\,\theta+1}{\sec\theta} = \sec\theta$

5) $\frac{1+\cos 2x}{\sin 2x} = \cot x$

6) $\frac{\cot\theta-\tan\theta}{\cot\theta+\tan\theta} = \cos 2\theta$

Directions for 7-9: Use the sum/difference/double or half angle formulas to find the exact value.

7) $\cos 105°$ 8) $\sin 345°$ 9) $\tan 15°$

Directions for 10-12: If $\tan x = -\frac{40}{9}$ and x is in Quadrant II and $\sin y = -\frac{3}{5}$ and y is in Quadrant IV, find the exact value. Draw the reference triangle.

10) $\cos(x - y)$ 11) $\sin\left(\frac{x}{2}\right)$ 12) $\tan(x + y)$

Directions for 13-14: Find the exact value of the following where $0° \leq x \leq 360°$.

13) $2\sec x + 1 = \sec x + 3$ 14) $2\cos^2 x - \sqrt{3}\cos x = 0$

Directions for 15-16: Find the approximate value of the following where $0° \leq x \leq 360°$.

15) $3\sin^2 x - \sin x = 2$ 16) $3\cos^2 x - 2 = 0$

Applications/Extensions

1) For each equation use your calculator to determine if the following are identities. Sketch the graph (with zoom trig) to show they are or aren't identities. If the equation is an identity, VERIFY IT! If it is not an identity, find a value of x, $\left(x = 0, \pi, \frac{\pi}{2}, \frac{\pi}{4}, \frac{\pi}{6}\right)$ for which both sides are defined but not equal.

a) $\frac{1+\tan x}{1+\cot x} = \frac{\sin x}{\cos x}$

Sketch:

Verification or value of x it does not work for (SHOW WORK:

2) Mr. Sullivan has a student he calls ROLLER COASTER. The reason is that he produces work in highs and lows. He develops a formula to predict ROLLER COASTER's work output which is: $m = 5\sin\left(\frac{4\pi}{365}d\right) + 5$, where *d* represents the day of the year (d=1 is January 1) and *m* represents the number of mastery checks passed on that day.

a) On what day(s) does ROLLER COASTER pass 3 mastery checks?

b) Use a graphing calculator (try www.desmos.com...seriously...its awesome) and find what the highest number of mastery checks ROLLER COASTER will pass on one day. What day(s) does that occur?