First Name:____________________ Last Name: __________________ Student ID: ________

Identities and Equations (1)

1. Use a counterexample to show that $\tan(\theta) + \sin(\theta) = \cot(\theta) + \cos(\theta)$ is not an identity.

2. Consider the trigonometric function $f(x) = \frac{\tan(x)+\sin(x)}{1+\cos(x)}$.

a. Identify the non-permissible values of x.
b. Graph $y = f(x)$ using graphing technology.
c. Use this graph to help create a possible trigonometric identity involving $f(x)$.
d. Prove your identity from part b) is true for all permissible values of the variable.

3. Prove.

a. $\csc^2(x) - \csc(x)\cot(x) = \frac{1}{1+\cos(x)}$

b. $\frac{\sin(\theta)+1}{1-\sin(\theta)} = (\tan(\theta) + \sec(\theta))^2$

c. $\frac{\tan(\beta)-\sin(\beta)}{\sin^3(\beta)} = \frac{\sec(\beta)}{1+\cos(\beta)}$

d. $\frac{\cos^3(\beta)+\sin^3(\beta)}{\sin(\theta)+\cos(\theta)} = 1 - \sin(\theta)\cos(\theta)$

e. $(\csc(\theta)\sec(\theta))^2 - \frac{(1-\tan^2(\theta))^2}{\tan^2(\theta)} = 4$

f. $\frac{\sin(x+y)}{\sin(x-y)} = \frac{\tan(x)+\tan(y)}{\tan(x)-\tan(y)}$

4. Determine the exact value of each trigonometric ratio. Express answers in simplest form.

a. $\sin(195^0)$

b. $\cos(\frac{19\pi}{12})$

5. Given $\sin(\theta) = \frac{15}{17}$ and $\cos(\beta) = \frac{1}{3}$, where $\frac{\pi}{2} < \theta < \pi$ and $\frac{3\pi}{2} < \beta < 2\pi$, determine the exact value of $\cos(\theta + \beta)$.

6. Simplify each expression to a single trigonometric ratio.

a. $\sin(3x)\cos(x) - \cos(3x)\sin(x)$

b. $\sin(\frac{\pi}{5})\sin(\frac{\pi}{3}) - \cos(\frac{\pi}{5})\cos(\frac{\pi}{3})$

c. $\frac{1-\tan(80^0)\tan(20^0)}{\tan(80^0)+\tan(20^0)}$