Trig Identity and Application Problem Set

1. Use $\csc\theta = -12/5$ and $\pi < \theta < 3\pi/2$ to evaluate all other trigonometric functions.

2. Expand and simplify, if possible.

$$(\cot x - \csc x)(\cos x + 1)$$

3. Factor and simplify, if possible.

$$\tan x \sin x \cos x + \cot x \sin x \cos x$$

4. Prove

$$\frac{\cos^2 x + \tan^2 x - 1}{\sin^2 x} = \tan^2 x$$

5. Prove

$$\frac{\sec x + \csc x}{\cot x + \tan x} = \cos x + \sin x$$

6. Solve the equations

   (a) $3\tan(x/2) + 3 = 0$

   (b) $2\sin^2 x - 5\sin x + 2 = 0$

   (c) $\tan^3 x + \tan^2 x - 3\tan x - 3 = 0$

7. Find all solutions to the equation, within the interval $[0, 2\pi)$. Round to the nearest thousandth.

   (a) $3\cos^2 x - 5\cos x - 4 = 0$

   (b) $10\sec^2 x - 10 = 7\tan x + 2$

Answer Key:

1. $\sin\theta = -5/12$, $\cos\theta = -\sqrt{119}/12$, $\tan\theta = 5\sqrt{119}/119$, $\sec\theta = -12\sqrt{119}/119$, $\cot\theta = \sqrt{119}/5$
2. $-\sin x$
3. 1
4. hint: rewrite $\cos^2$ as $1 - \sin^2 x$
5. hint: rewrite all the trig functions in term of $\sin x$ and $\cos x$
6. (a) $3\pi/2 + 2\pi n$
   (b) $\pi/6 + 2\pi n$, $5\pi/6 + 2\pi n$
   (c) $\pi/3 + \pi n$, $2\pi/3 + \pi n$, $3\pi/4 + \pi n$
7. (a) 2.203, 4.081
   (b) 0.734, 2.927, 3.884, 6.069