## Problem Statements

### Fundamental Trigonometric Identities

#### Reciprocal Identities
- \( \csc(\theta) = \frac{1}{\sin(\theta)} \)
- \( \sec(\theta) = \frac{1}{\cos(\theta)} \)
- \( \cot(\theta) = \frac{1}{\tan(\theta)} \)

#### Quotient Identities
- \( \tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} \)
- \( \cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)} \)

#### Pythagorean Identities
- \( \sin^2(\theta) + \cos^2(\theta) = 1 \)
- \( 1 + \cot^2(\theta) = \csc^2(\theta) \)
- \( \tan^2(\theta) + 1 = \sec^2(\theta) \)

#### Cofunctions
- \( \sin\left(\frac{\pi}{2} - \theta\right) = \cos(\theta) \)
- \( \cos\left(\frac{\pi}{2} - \theta\right) = \sin(\theta) \)
- \( \tan\left(\frac{\pi}{2} - \theta\right) = \cot(\theta) \)
- \( \cot\left(\frac{\pi}{2} - \theta\right) = \tan(\theta) \)
- \( \sec\left(\frac{\pi}{2} - \theta\right) = \csc(\theta) \)
- \( \csc\left(\frac{\pi}{2} - \theta\right) = \sec(\theta) \)

#### Even/Odd Identities
- \( \sin(-\theta) = -\sin(\theta) \)
- \( \cos(-\theta) = \cos(\theta) \)
- \( \tan(-\theta) = -\tan(\theta) \)
- \( \csc(-\theta) = -\csc(\theta) \)
- \( \sec(-\theta) = \sec(\theta) \)
- \( \cot(-\theta) = -\cot(\theta) \)

#### Sum and Difference Identities
- \( \sin(u + v) = \sin(u) \cos(v) + \cos(u) \sin(v) \)
- \( \sin(u - v) = \sin(u) \cos(v) - \cos(u) \sin(v) \)
- \( \cos(u + v) = \cos(u) \cos(v) - \sin(u) \sin(v) \)
- \( \cos(u - v) = \cos(u) \cos(v) + \sin(u) \sin(v) \)
- \( \tan(u + v) = \frac{\tan(u) + \tan(v)}{1 - \tan(u) \tan(v)} \)
- \( \tan(u - v) = \frac{\tan(u) - \tan(v)}{1 + \tan(u) \tan(v)} \)

#### Double Angle Identities
- \( \sin(2u) = 2 \sin(u) \cos(u) \)
- \( \cos(2u) = \cos^2(u) - \sin^2(u) \)
  
  \( = 2 \cos^2(u) - 1 \)
  
  \( = 1 - 2 \sin^2(u) \)
Math 150 Week-in-review 11 (Exam Review)

1. Find the exact value of $\sin\left(\frac{5\pi}{12}\right)$, if $\frac{5\pi}{12} = \frac{5\pi}{3} - \frac{5\pi}{4}$.

2. Find the exact value of $\cos(115^\circ) \cos(5^\circ) - \sin(115^\circ) \sin(5^\circ)$.

3. Find the exact value of $\frac{\tan(\pi/15) + \tan(4\pi/15)}{1 - \tan(\pi/15) \tan(4\pi/15)}$.

4. Rewrite $\sin(x) \cos(3x) + \sin(3x) \cos(x)$ as a single expression.
Review Problems

1. Convert $75^\circ$ to radians.

2. Convert $\frac{19\pi}{12}$ to degrees.

3. A circular sector created by a central angle of $\frac{3}{5}$ radians has an area of $1080$ ft$^2$, determine the radius of the circle.

4. The planet Neptune has an orbit that is nearly circular. It orbits the Sun at a distance of $4497$ million kilometers and completes one revolution every $165$ years. How long is a full path of Neptune around the Sun? Then find the linear velocity of Neptune as it orbits the Sun.
5. Given \( \cos(\theta) = \frac{2}{5} \) and \( \tan(\theta) < 0 \), find the value of \( \cot(\theta) \).

6. Given \( t \) corresponds to the point \( \left(-\frac{3}{4}, \frac{\sqrt{7}}{4}\right) \) is on the unit circle, find the value of \( \sin(t) \) and \( \sec(t) \).

7. Given \( y = 0.5 \sin (3\pi x + 2) + 5 \), state the amplitude, period and phase shift of the graph.
8. State the domain and range of $y = \tan(x)$

9. State the domain and range of $y = \arccos(x)$

10. From his hotel room window on the sixth floor, Saleh notices some window washers high above him on the hotel across the street. Curious as to their height above the ground, he quickly estimates the buildings are 50 ft apart and the angle of elevation to the workers is $80^\circ$. Leave all answers in exact form.

   a) How far apart are Saleh and the window washers?

   b) If Saleh’s hotel floor is 60ft above ground, how far are the window washers from the ground?
11. Simplify each composition, if possible.

\[ \tan \left[ \arctan(\sqrt{3}) \right] = \] 

\[ \arcsin \left[ \sin \left( \frac{3\pi}{4} \right) \right] = \] 

\[ \cos^{-1} [\tan(0)] = \] 

\[ \tan \left[ \arccos \left( \frac{x}{\sqrt{x^2 + 16}} \right) \right] = \] 

12. Find all solutions to \( \sqrt{2} \sec(x) + 3 = 7 \)
13. Solve the equation \( \sin(2x) + \cos(x) = 0 \)

14. Find all solutions to the equation \( 4 \sin^2(4x) - 1 = 2 \).