1. (10 pts) Find the exact value of the trigonometric function given that \( \cos u = \frac{1}{\sqrt{2}} \), \( \sin v = -\frac{3}{\sqrt{2}} \) and both \( u \) and \( v \) are in quadrant IV.
   (a) \( \csc (u - v) \)
   (b) \( \cot (u + v) \)

2. (10 pts) Find all solutions in the interval \([0, 2\pi)\).
   \[ \sin \left( x + \frac{\pi}{3} \right) - \sin \left( x - \frac{\pi}{3} \right) = 1 \]

3. (8 pts) Find the exact values of \( \sin \left( \frac{\pi}{4} \right) \) and \( \cos \left( \frac{\pi}{4} \right) \) given
   \[ \tan u = \frac{3}{2}, \quad \pi < u < \frac{3\pi}{2} \]
4. (12 pts) Rewrite the expression in terms of the first power of cosine.

\[ \sin^2 x \cos^2 x \]

5. (12 pts) Solve a triangle with the given information. If 2 solutions exist find both. If no solution exists state why.

\[ A = 40^\circ \quad a = 8 \quad b = 10 \]

6. (12 pts) To approximate the length of a marsh, a surveyor walks 300 m from point A to point B, then turns 80° and walks 250 m to point C. Approximate the length from point A to point C.

7. (12 pts) Convert to trigonometric form and then perform the indicated operation. Leave your answer in trigonometric form.

(a) \((\sqrt{3} - i)(2 - 2\sqrt{3}i)\)

(b) \((1 - i)^7\)
38. (12 pts) Find all possible roots to $z^6 - 1 = 0$.

39. (12 pts) Because of prevailing winds, a tree grew so that it was leaning $8^\circ$ from the vertical. At a point 35 m from the base of the tree, the angle of elevation to the top of the tree is $22^\circ 50'$.

Find the height of the tree.