(1-4) Prove if the following identities are true, or disprove if they are not true.

(8) 1. \( \cot(\tan \theta) = 1 \)

(8) 2. \( \sin(u + v) \cdot \sin(u - v) = \sin^2 u - \sin^2 v \)
(10) 3. \( \sin 3u = \sin u(3 - 4 \sin^2 u) \)

(8) 4. \( 4 \cos x \cos 2x \sin 3x = \sin 2x + \sin 4x + \sin 6x \)

(5-7) Find the solutions of the equations that are in the interval \([0, 2\pi)\).

(6) 5. \( \cos 5t \cos 2t = -\sin 5t \sin 2t \)
6. \( \sin 2u + \sin u = 0 \)

7. \( 2 \cos \theta - \sin^2 \theta = 0 \) (Approximate the solutions to four decimal places)

8. Find the exact values.

4. (a) \( \sin \frac{7\pi}{12} \) (use \( \frac{7\pi}{12} = \frac{3\pi}{4} - \frac{\pi}{6} \))

(b) \( \cos \frac{11\pi}{12} \) (use \( \frac{11\pi}{12} = \frac{2\pi}{3} + \frac{\pi}{4} \))
(6) (c) $\tan \frac{5\pi}{12}$ (use $\frac{5\pi}{12} = \frac{\pi}{4} + \frac{\pi}{6}$)

9. Find the exact values.

(4) (a) $\sin^{-1} (\sin \frac{2\pi}{3})$

(4) (b) $(f) \sin [\cos^{-1} (-\frac{1}{2})]$

(4) (c) $\cos (2 \sin^{-1} (-\frac{3}{5}))$

(4) (d) $\cos (\cos^{-1} (\frac{8}{17}) - \sin^{-1} (\frac{4}{5}))$

(4) (e) $\tan (\frac{1}{2} \cos^{-1} \frac{3}{4})$

(8) 10. If $\alpha$ and $\beta$ are acute angles such that $\csc \alpha = \frac{13}{12}$ and $\cot \beta = \frac{4}{3}$, find

(a) $\sin (\alpha + \beta)$
(b) \(\cos(\alpha + \beta)\)

(c) \(\tan(\alpha + \beta)\)

(d) the quadrant containing \(\alpha + \beta\)

(extra 10) 11. Find all \(\theta\) of the equation

\[
\left(\sin(\cos^{-1} x)\right)^2 + \left(\cos(\sin^{-1} x)\right)^2 = 1,
\]

where \(x = \sin \theta, \ -\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}\), and \(-1 \leq x \leq 1\). (Hint: Solve the first equation for \(x\), and then find \(\theta\).)