

Show any relevant work. For each problem, circle your final answer

1. (20 points) Verify each of the following Identities

(8pts) a. $\tan^2 x + \sec^2 x = 2\tan^2 x + 1$

$$\tan^2 x + (1 + \tan^2 x) \quad (+3)$$

Pythagorean ID (+3)

$$\tan^2 x + \tan^2 x + 1 = 2\tan^2 x + 1 \quad (+2)$$

(2pts) b. $\cos(\pi + x) - \cos(\pi - x) = 0$ (Use the sum and difference formulas)

$$\cos \pi \cos x - \sin \pi \sin x - (\cos \pi \cos x + \sin \pi \sin x) \quad (+3)$$

$$\cos \pi \cos x - \sin \pi \sin x - \cos \pi \cos x - \sin \pi \sin x \quad (+3)$$

$$-1 \cdot \cos x - 0 \cdot \sin x - (-1) \cdot \cos x - 0 \cdot \sin x \quad (+3)$$

$$-\cos x + \cos x = 0 \quad (+3)$$

2. (20 points) Use the sum and difference formulas to evaluate each of the following expressions.

(10pts) a. $\cos \frac{7\pi}{12} = \cos \left(\frac{3\pi}{12} + \frac{4\pi}{12} \right) \quad (+2)$
others possible $= \cos \left(\frac{\pi}{4} + \frac{\pi}{3} \right) \quad (+2)$

$$= \cos \frac{\pi}{4} \cos \frac{\pi}{3} - \sin \frac{\pi}{4} \sin \frac{\pi}{3} \quad (+2)$$

$$= \frac{\sqrt{2}}{2} \cdot \frac{1}{2} - \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} \quad (+2)$$

$$= \frac{\sqrt{2}}{4} - \frac{\sqrt{6}}{4} = \frac{\sqrt{2} - \sqrt{6}}{4} \quad (+2)$$

(10pts) b. $\sin \frac{5\pi}{12} \cos \frac{\pi}{4} - \cos \frac{5\pi}{12} \sin \frac{\pi}{4} = \sin \frac{5\pi}{12} \cos \frac{3\pi}{12} - \cos \frac{5\pi}{12} \sin \frac{3\pi}{12} \quad (+1)$

$$(+1) \quad \frac{\pi}{4} = \frac{3\pi}{12} \quad (+4)$$

$$= \sin \left(\frac{5\pi}{12} - \frac{3\pi}{12} \right) = \sin \left(\frac{2\pi}{12} \right) \quad (+1)$$

$$= \sin \frac{\pi}{6} = \frac{1}{2} \quad (+2)$$

(+1)

(+2)