MATH 119: Quiz 5

Name: Key

Directions:

- Show your thought process (commonly said as "show your work") when solving each problem for full credit. **Remember to fully simplify.**
- If you do not know how to solve a problem, try your best and/or explain in English what you would do.
- Good luck!

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1. Prove the identity

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

two terms and 1 term.

this tells me I need to delete the 1 from LHS!

$$LHS = \frac{1-\cos 2x}{\sin 2x}$$

commonly forgot.

only $\cos 2x$ identity which deletes the 1.

$$= \frac{1-(1-2\sin^2(x))}{2\sin x\cos x}$$

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

$$= \frac{2\sin^2(x)}{2\sin x\cos x} \quad \sin x$$

$$= \frac{\sin x}{\cos x} = \tan x = RHS$$

2. Evaluate the expression $\sin\left(\frac{9\pi}{8}\right)$.

$\frac{9\pi}{8}$ in Q3, sin − in Q3.

half of something you know how to take.

$$\sin\left(\frac{9\pi}{8}\right) = \sin\left(\frac{9\pi}{2\cdot 4}\right) = \sin\left(\frac{1}{2}\cdot\frac{9\pi}{4}\right) = -\sqrt{\frac{1-\cos\left(\frac{9\pi}{4}\right)}{2}}$$

$$= -\sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2}} = -\sqrt{\frac{\frac{2}{2}-\frac{\sqrt{2}}{2}}{2}} = -\sqrt{\frac{\frac{2-\sqrt{2}}{2}}{2}} = -\sqrt{\frac{2-\sqrt{2}}{4}}$$

$$= -\frac{\sqrt{2-\sqrt{2}}}{\sqrt{4}} = \boxed{-\frac{\sqrt{2-\sqrt{2}}}{2}}$$

3. Prove the identity

$$\frac{\sin x + \sin 5x}{\cos x + \cos 5x} = \tan 3x$$

$$LHS = \frac{\sin x + \sin 5x}{\cos x + \cos 5x}$$

$$= \frac{2\sin\left(\frac{x+5x}{2}\right)\cos\left(\frac{x-5x}{2}\right)}{2\cos\left(\frac{x+5x}{2}\right)\cos\left(\frac{x-5x}{2}\right)}$$

$$= \frac{2\sin\left(\frac{6x}{2}\right)\cos\left(\frac{-4x}{2}\right)}{2\cos\left(\frac{6x}{2}\right)\cos\left(\frac{-4x}{2}\right)}$$

$$= \frac{2\sin(3x)\cos(-2x)}{2\cos(3x)\cos(-2x)}$$

$$= \frac{\sin(3x)}{\cos(3x)}$$

$$= \tan(3x)$$

$$= RHS.$$