Precalculus Unit 5 worksheet: Verifying identities

Name _____ Date _____ Period _____

1. Verify each identity by working on one side only, naming the identity used at each step. State the common domain, with k standing for any integer.

(a) $\sec x \csc x \cos^2 x = \cot x$

(b) $(1 - \sin^2 x)(1 + \cot^2 x) = \cot^2 x$

(c) $\sec^2 x \cot^2 x - \cot^2 x = 1$

(d) $\dfrac{\tan^2 x}{\sec x} = \sec x - \cos x$

2. Verify each identity and state its common domain. Combine fractions, or multiply by a conjugate, where that helps.

(a) $\dfrac{1}{\sec x - \cos x} = \cot x \csc x$

(b) $\dfrac{\sin x}{\csc x + \cot x} = 1 - \cos x$

3. Decide whether each equation is an identity. Verify it, with its common domain, or give a counterexample.

(a) $\dfrac{\cot x - \tan x}{\sin x \cos x} = \csc^2 x - \sec^2 x$

(b) $\cos^4 x - \sin^4 x = 1$

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4. (a) Verify $\dfrac{\csc^2 x - 2\csc x + 1}{\cot^2 x} = \dfrac{\csc x - 1}{\csc x + 1}$ and state the common domain.

(b) At $x = \dfrac{\pi}{2}$ the right side has the value 0. Explain why this does not contradict the identity, and why it is not a counterexample either.

5. Verify $\dfrac{\sin x - \cos x + 1}{\sin x + \cos x - 1} = \dfrac{\sin x + 1}{\cos x}$ and state the common domain. (Hint: multiply the top and bottom of the left side by $\sin x + 1$, and expand only the denominator.)

6. Elena claims that $\sin x + \cos x = \sqrt{1 + 2\sin x \cos x}$ for every x. Her argument: "Square both sides. The left becomes $\sin^2 x + 2\sin x \cos x + \cos^2 x = 1 + 2\sin x \cos x$, which is the right side squared. True, so the claim holds."

(a) Give a counterexample to her claim.

(b) Explain what is wrong with her argument.

(c) Write a correct chain that starts from the right side, and use it to state a condition on $\sin x + \cos x$ that tells exactly when her claim is true.

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