Calculus 1 Unit 1 quiz 3: The squeeze theorem and the limit of sine x over x, Continuity at a point, Continuity on an interval

Name _____ Date _____ Period _____

8 questions, 20 points

1. Find $\lim_{x \to 0} \dfrac{x \tan 8x}{\sin^2 2x}$. (2 points)

2. Functions f and g are continuous at 3, with $g(3) = 4$ and $f(3) > g(3)$. Also $\lim_{x \to 3} \sqrt{f(x) - g(x)} = 2$. (2 points)

(a) Find $f(3)$.

(b) Find $\lim_{x \to 3} \dfrac{f(x) + g(x)}{f(x) - g(x)}$.

Name the results you use.

3. Let $f(x) = \dfrac{\sqrt[3]{x+4}}{x^2+3}$. Find the largest interval on which f is continuous, then use continuity to find $\lim_{x \to -5} f(x)$. (2 points)

4. Let $f(x) = \dfrac{\sqrt{x+5}}{x^2 - 2x - 3}$. Find the largest intervals on which f is continuous, and say which one-sided condition holds at any end an interval includes. (2 points)

5. The greatest integer function $\lfloor t \rfloor$ gives the greatest integer less than or equal to t. Use the squeeze theorem to find $\lim_{x \to 0^+} x \left\lfloor \dfrac{1}{x} \right\rfloor$. (3 points)

6. A function g satisfies $\cos x \le g(x) \le 1 + x^2$ for every x. Find $\lim_{x \to 0} \dfrac{g(x) \sin 3x}{2x}$. (3 points)

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7. Let $g(x) = x^2 - 2x$, and let $f(u) = \dfrac{u^2 - 1}{u + 1}$ for $u \neq -1$, with $f(-1) = 0$. Find every number x at which $f\big(g(x)\big)$ is not continuous, and name the condition that fails there. Justify your answer. (3 points)

8. Let $f(x) = \dfrac{x^2 - 7x + 12}{x^2 - 9}$ for $x \neq \pm 3$, with $f(3) = -\dfrac{1}{6}$ and $f(-3) = 0$. Decide whether f is continuous at 3 and whether it is continuous at -3. Where it is not, name the condition that fails. (3 points)

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