Math 201 Quiz 4A

September 12, 2014

Name: ANSWERS

Instructions: No calculators. Use your own scrap. Write your fully simplified answers in the space provided.

1. Let $f(x)$ be a function. Write down an equation that defines when $f(x)$ is continuous at a point $x = n$.

$$\lim_{x \to n} f(x) = f(n)$$

2. Compute the following limits, or write "DNE" if they do not exist:

(a) $\lim_{x \to 0} \frac{\cos^3 x}{4 + 2x^4} =$ ___$\frac{1}{4}$___

(b) $\lim_{x \to 16} \frac{4 - \sqrt{x}}{16x - x^2} =$ ___$\frac{1}{128}$___

(c) $\lim_{h \to 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} =$ ___$-\frac{2}{x^3}$___

(d) $\lim_{x \to 9} \frac{3x - 27}{|x - 9|} =$ ___DNE___

(e) $\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{|x|} \right) =$ ___0___

(f) $\lim_{x \to 0} \frac{\sin x^3}{x} =$ ___0___

(g) $\lim_{t \to 0} \frac{\tan 2t}{3t + \sin 4t} =$ ___$2/7$___

(h) $\lim_{x \to 0} \frac{4 - 4\cos x}{\sin x} =$ ___0___

(i) $\lim_{x \to 0} \frac{\sin 4x}{3x^2 - 2x} =$ ___-2___

(j) $\lim_{x \to 0} \frac{\sin 3x \sin 5x}{2x^2} =$ ___$15/2$___

3. Suppose $2x \le h(x) \le x^4 - x^2 + 2$ for all x, what is $\lim_{x \to 1} h(x) =$ ___2___

4. Let $f(x) = 2x^2 + 1$, compute $\lim_{h \to 0} \frac{f(2+h) - f(2)}{h} =$ ___8___

Bonus:

(a) Explain what the answer to problem 4 means ___The slope/derivative of $f(x)$ at $x = 2$ is 8.___

(b) Find a and b so that $f(x) = \begin{cases} \frac{3 \sin x}{x}, & x < 0 \\ a, & x = 0 \\ b\cos x, & x > 0 \end{cases}$ is continuous for all x. $a =$ ___3___ , $b =$ ___3___

(c) $\lim_{x \to -1^+} \frac{x^2 - 4x}{x^2 - 3x - 4} =$ ___$-\infty$___