Math 201 Quiz 4B

September 12, 2014

Name: ANSWERS

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

1. Suppose $5x \le p(x) \le x^4 - x^2 + 5$ for all x, what is $\lim_{x\to 1} p(x) =$ 5

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

   (a) $\lim_{x\to 0} \frac{\cos^3 x}{3+5x^4} =$ 1/3 (b) $\lim_{x\to 9} \frac{3-\sqrt{x}}{9x-x^2} =$ 1/54

   (c) $\lim_{h\to 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} =$ $-2/x^3$ (d) $\lim_{x\to 9} \frac{3x-27}{|x-9|} =$ DNE

   (e) $\lim_{x\to 0} \left(\frac{1}{x} - \frac{1}{|x|}\right) =$ DNE (f) $\lim_{x\to 0} \frac{\sin x^3}{x} =$ 0

   (g) $\lim_{t\to 0} \frac{\tan 3t}{4t+\sin 5t} =$ 1/3 (h) $\lim_{x\to 0} \frac{3-3\cos x}{\sin x} =$ 0

   (i) $\lim_{x\to 0} \frac{\sin 5x}{3x^2-4x} =$ $-5/4$ (j) $\lim_{x\to 0} \frac{\sin 4x \sin 5x}{3x^2} =$ 20/3

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

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

4. Let $f(x) = 3x^2 + 1$, compute $\lim_{h\to 0} \frac{f(2+h)-f(2)}{h} =$ 12

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 $f(x) = \begin{cases} \frac{4\sin x}{x}, x < 0 \\ a, x = 0 \\ b\cos x, x > 0 \end{cases}$ is continuous for all x. $a =$ 4, $b =$ 4

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