Math 140, Jeffrey Adams

Test I, February 12, 2010

IMPORTANT INSTRUCTIONS

1. Write your name, section number, and TA's name on each answer sheet.

2. Number the sheets 1-5. Do all of the work for problem 1 on sheet 1. You may use the back if necessary – write "see back of sheet". Similarly for problems 2-5. Each problem is worth 20 points.

3. For full credit you must show your work.

4. No calculators.

Question 1.

(a) Let $f(x) = x^2 - 3x$. By taking a limit find the slope of the line tangent to the graph of f(x) at the point (3, 0).

(b) Give the equation of the line in (a).

Question 2. Evaluate each of the following limits. Your answer should be either a number, $+\infty$ or $-\infty$, or "does not exist". Justify your answers.

[7] (a)
$$\lim_{x \to 3} \frac{|x^2 - 9|}{x - 3}$$

[6] (b)
$$\lim_{x \to 0} \frac{\sin(x)}{\sin(2x)}$$

[6] (c) $\lim_{x\to 0} \sin(\pi \cos(x))$

[6] (d)
$$\lim_{x \to \frac{\pi}{2}^+} \tan(x)$$

Question 3. (20 points) Let $f(x) = \begin{cases} e^x & x > 0\\ 1 & x \le 0 \end{cases}$

(a) Evaluate $\lim_{x\to 0^+} f(x)$ and $\lim_{x\to 0^-} f(x)$.

(b) Is f continuous from the left at 0? Continuous from the right at 0? Continuous at 0? Justify your answers.

Question 4. Find all vertical asymptotes of the function $f(x) = \frac{(x^2 - 4)(x^2 - 1)}{(x + 1)(x - 2)^2}$. Question 5. Show that there is a number x with $\sin(x) = \frac{1}{e}$. Justify your answer.

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