

Math 151 Section 33
First Midterm
October 20, 2006
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Name:

This test is worth 100 points; the value of each question is provided. Please show your work so that partial credit can be awarded.

1. (3 points each) Use the limit theorems to find the following limits. If a limit does not exist, write “dne”.

(a) $\lim_{x \rightarrow 0} \frac{|x|}{x}$

(b) $\lim_{x \rightarrow -3} \sqrt{x^2}$

(c) $\lim_{x \rightarrow 4} \frac{x-4}{(x-4)(x+3)}$

(d) $\lim_{x \rightarrow 0} \frac{2\sin(x)\cos(x)}{2x}$

(e) $\lim_{x \rightarrow 1} \frac{x+4}{x^2+3x-4}$

2. (10 points each) Solve the following for x . Write in interval notation.

(a) $x^3 + 2x^2 - 3x > 0$

(b) $0 < |2x - 4| < 3$

3. (a) (5 points) Write the mathematical definition for the following statement:
The limit of a function f as x goes to c is L .

(b)(10 points) Explain, in complete sentences, what the above definition means. You are encouraged to include a picture or diagram, which should be clearly labeled and accompanied by a written explanation.

4. (20 points) Prove, using only the $\epsilon - \delta$ definition, that $f(x) = x^2 + 3x$ is continuous at $x = 2$.

5. (20 points) Prove using mathematical induction that, for every positive integer n ,

$$1 + 3 + 5 + \cdots + (2n - 1) = n^2$$