

Sample Midterm 1, Math 1A, Section 1

Midterm 1 will be in class, Tuesday September 23, 2008, from 8:10 - 9:30 am. Please write your answers in a blue book. You should probably bring an extra one, in case you need more room. Use a different page for each question. Give justification for your answers. You may use a crib sheet, but if so you must turn it in with your exam. When you are done with the exam, slip the exam and sheet into the front of the booklet. The exam will cover Chapter 1, and sections 2.1 and 2.2.

1. Interpret the following limit as a derivative and evaluate the limit using the appropriate differentiation rule.

$$\lim_{x \rightarrow 1} \frac{x^{50} - 1}{x - 1}$$

2. Suppose the function f is even and g is odd. Determine whether each of the following functions is always even, always odd, or neither. If the function is even or odd, prove it. If neither, give an example of f and g such that the new function is neither even nor odd.

$$(i) f \circ g \quad (ii) g \circ f \quad (iii) fg \quad (iv) f + g$$

3. Let $f(x) = -x \sin x + \cos x$. Show that there is a point c between 0 and $\pi/2$ such that $f(c) = 0$.

4. Evaluate the limit

$$\lim_{t \rightarrow 0} \frac{t^2}{1 - \cos 5t}$$

5. Use the $\delta - \epsilon$ definition of the limit to prove that $\lim_{x \rightarrow 1} \sqrt{x} = 1$.

6. Suppose $\lim_{x \rightarrow \infty} [f(x) - 2x] = 3$. Evaluate $\lim_{x \rightarrow \infty} \frac{f(x)}{x}$. Justify your answer.

7. Compute the derivative $f'(3/5)$ where $f(x) = \sqrt{1 - x^2}$ using the limit definition of the derivative.