

Math 151
Quiz 5
Spring 2006

Show all work in a neat and organized fashion. Clearly indicate your answers.
20 points possible.

1. (10 pts.) Given:

$$f(x) = \text{unknown continuous function, with domain the set of all real numbers}$$
$$f'(x) = (5x + 3)(x + 3)^3, \quad f''(x) = 4(5x + 6)(x + 3)^2$$

- (a) Find the critical numbers of f .
 - (b) Find the intervals on which f is increasing or decreasing.
 - (c) Find the x -coordinates of all local maxima and local minima of f .
 - (d) Find the intervals of concavity.
 - (e) Find the x -coordinates of all points of inflection.
2. (5 pts.) Verify that the function satisfies the hypotheses of the Mean Value Theorem on the given interval $[a, b]$. Then find all numbers c such that

$$f'(c) = \frac{f(b) - f(a)}{b - a}.$$

$$f(x) = x^3 - 8x, \quad [-2, 6]$$

3. (5 pts.) Find the following limits.

(a) $\lim_{x \rightarrow +\infty} \frac{x + 3}{x^2 - 9}$

(b) $\lim_{x \rightarrow -\infty} \frac{x + 3}{x^2 - 9}$

(c) $\lim_{x \rightarrow 3^+} \frac{x + 3}{x^2 - 9}$

(d) $\lim_{x \rightarrow 3^-} \frac{x + 3}{x^2 - 9}$

(e) $\lim_{x \rightarrow -3} \frac{x + 3}{x^2 - 9}$