MAT 201, Test 3, Spring, 2011 100 Points

## Name\_\_\_\_\_

(20 pts) Answer one of the following versions of #1, below:

1. Use the information to sketch the graph of f(x):

 $\lim_{x \to 1^{-}} f(x) = -\infty, \lim_{x \to 1^{+}} f(x) = -\infty, \lim_{x \to -\infty} f(x) = 1, \lim_{x \to \infty} f(x) = \infty$ 

$$f(0) = 0, f(2) = -3, f(3) = 0$$

$$\frac{f' \quad neg \quad | \quad pos \_\_\_}{f'' \quad neg \quad | \quad neg \quad | \quad pos}$$

$$1 \quad 2$$

- 1. Sketch the graph of  $f(x) = 2x^3 + 3x^2 36x 54$ . Show all the main features:
  - a. *y*-intercept(s)
  - b. local extrema
  - c. inflection point(s)
  - d. x-intercept(s) (Hint: There's one @ x = -3/2.) These are extra-credit.

2. (20 pts) Find the local and absolute extreme values of  $f(x) = 2x^3 + 3x^2 - 36x - 54$  on [0,6].

3. (10 pts) Find all values c that satisfy the conclusion of the Mean Value Theorem for  $f(x) = x^3 - 6x^2 + 5x + 6$  on [0,6]. For partial or extra credit, confirm that the hypotheses of the Mean Value Theorem are satisfied.

4. Find the limit.

a. (10 pts) 
$$\lim_{t \to \infty} \frac{3t^3 - 4t^2 + 11}{5 - 3t - 12t^3}$$

b. (10 pts) 
$$\lim_{t \to -\infty} \left( \sqrt{16t^2 - 7t} + 4t \right)$$

5. (10 pts) Given  $f'(x) = \sec^2(x) - \sin(x)$  and f(0) = 3, find f(x).

6. (10 pts) Find the point that minimizes the distance between the graph of the line y = 3x + 1 and the point (4,3).

7. (10 pts) Use Newton's method to find the second and third approximations to the real root of the equation  $x^2 = 7$ . For uniformity, use  $x_1 = 2$ , and approximate  $x_2$  and  $x_3$  to four decimal places.