EXAM 3
Math 106
August 31, 2006

Name _____

A

You must show all your work. Partial credit will be given.

1. Suppose a train is traveling at 47 mph and is accelerating at 3 mph every 2 minutes. Estimate the speed of the train after three minutes have elapsed. (5 pts)

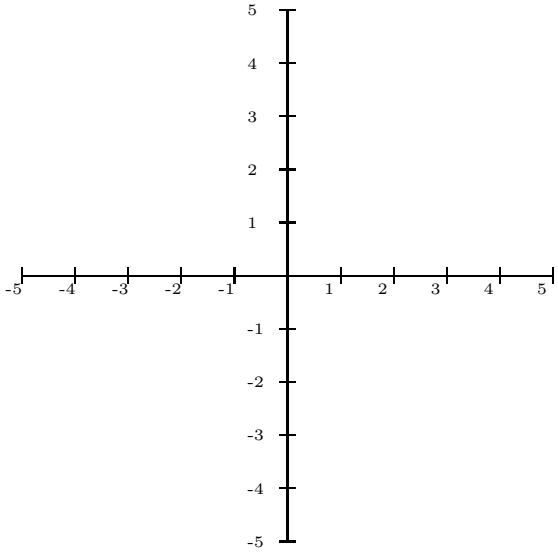
2. Two thousand five hundred dollars invested in an account that pays 8% interest, compounded quarterly, will generate an amount $A = 2500(1.02^{4t})$ dollars in t years.

   (a) How much is in the account after 6 years and what is the rate of change of the amount in the account at 6 years? (10 pts)

   (b) Using part a estimate the amount you would expect to be in the account after five and one half years. (Do not use the equation to find an exact amount, use your previous answers to arrive at an estimate.) (5 pts)

3. If $g(15) = 9$ and $g'(15) = 2.2$ estimate $f(15.5)$. (5 pts)

4. Sketch the graph of a function f such that
   $f'(x) > 0$ for $x < 0$
   $f'(x) < 0$ for $0 < x < 2$ and $x > 2$
   $f'(0) = 0$ and $f'(2) = 0$. (10 pts)



5. Suppose a company sells storm windows. They believe that their monthly profit is given by $P(x) = -2x^3 + 15x^2 + 11x - 24$ thousands of dollars where x is the number of windows sold every day. Find the maximum and minimum profit for selling between 1 and 6 windows per day. (15 pts)

6. Find all extrema of the equation $y = 10x^4 - 80x + 25$. (10 pts)

7. The rate of change of the temperature during the hour and a half after a thunderstorm began is modeled by the equation

$$T(h) = 9.48x^3 - 15.49x^2 + 17.38x - 9.87$$

degrees Fahrenheit per hour where x is he number of hours since the storm began. Use five left-hand rectangles to estimate the area between this curve and the x-axes between $x = 1$ and $x = 2$. (15 pts)

8. Accelerations (rate of change in speed) for a vehicle during a road test are approximated in the following table.

Time (seconds)	Accelerations (feet per second squared)
0	22.6
2	18.2
4	14.5
6	11.4
8	8.9
10	7.1
12	5.9

(a) Find an quadratic model for this data. (5 pts)

(b) Use the idea of the limit of sums to estimate the area under curve between the inputs 0 and 12. (By curve I mean the curve you found in part a) not the table itself) Give an English language interpretation of your answer in terms of the data given. (15 pts)

9. Assume the following graph is of some function $f(x)$. Also assume the the areas labeled A and B are of exactly the same size. What does $\int_{-.25}^{1.5} f(x)\,dx$ equal? (Hint: no calculation is needed.) (5 pts)