EXAM 3
Math 106
September 1, 2006

Name _____

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

1. Three 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 three years and what is the rate of change of the amount in the account at three years? (6 pts)

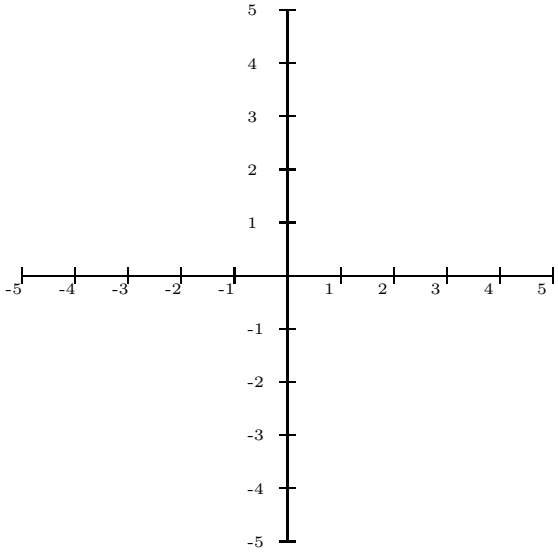
   (b) Using part a estimate the amount you would expect to be in the account after four and one half years. (Do not use the equation to find an exact amount, use your previous answers to arrive at an estimate.) (4 pts)

2. Give **estimates** for each of the following

   (a) If a rocket is rising at 250 feet per second and is accelerating at a rate of 15 feet per second every minute, estimate the rockets speed in 2 minutes. (5 pts)

   (b) If $f(6) = 3$ and $f'(6) = 3.2$ estimate $f(7.25)$. (5 pts)

3. 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 $f'(2) = 0$. (9 pts)



4. For each of the following functions find all relative maximums and/or minimums that exist. (5 pts each)

   (a) $g(x) = -5x^3 + 10x - 17$

   (b) $h(x) = e^{x^2}$

5. 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)

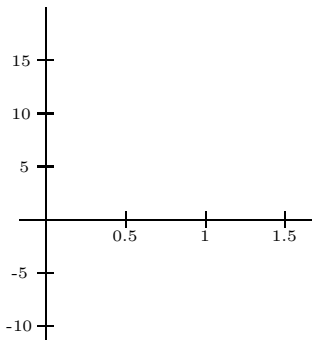
(b) Use 5 left-side rectangles to estimate the area of the region between the graph of your model and the input axis from 0 to 12 seconds. Interpret your answer. (12 pts)

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

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

degrees Fahrenheit per hour where h is he number of hours since the storm began.

(a) Graph the equation on the axis below and determine where the function crosses the horizontal axis. (The h-axis.) (5 pts)



(b) Use the concept of a limit of sums to **estimate** the value of $\int_A^{1.5} T(h)\ dh$, where A is the value you found in part a. (That is, the place where the graph crosses the axis.) (10 pts)

(c) If the temperature was 73° at time $h = A$ what is the temperature at time $h = 1.5$? (5 pts)

7. Suppose $f(x) = 3x^2 + 2x - x^{-1}$ find the specific antidervative $F(x)$ such that $F(5) = 150$. (5 pts)

8. For each of the following functions find its family of antiderivatives. (5 pts each)

(a) $y = 2x^3 - 5x + 3$

(b) $f(x) = 7x - \dfrac{1}{x}$

(c) $g(t) = 3\dfrac{1}{t^2} + 2e^t$

(d) $g(x) = 3^x - x^3$