MATH 108 – 17 JUNE 1999 – EXAM 4

Answer each of the following questions. Show all work, as partial credit may be given. This exam will be counted out of a total of 60 points.

1. (10 pts.) Find the absolute maximum and minimum values of the function $f(x) = -x^3 + 9x^2 + 500$ on the interval $0 \leq x \leq 10$.

2. It is estimated that the population in a certain community t years from now will be $P(t) = -t^3 + 9t^2 - 15t + 500$ hundred people.

(a) (10 pts.) At what time during the next 8 years does the population reach its maximum?

(b) (10 pts.) At what time during the next 8 years is the population increasing most rapidly?

3. (10 pts.) A store will sell 1,000 half–gallon containers of ice cream over the course of a year. Suppose that the cost of storing one half–gallon container of ice cream is 6 dollars per year, and that the ordering cost per shipment is 30 dollars. How large should each shipment be in order to keep total cost at a minimum? (Assume that the ice cream is sold at a constant rate throughout the year and that each shipment arrives just as the previous shipment is used up.)

4. (10 pts.) Suppose that after 5 days the number of bacteria in a colony has grown from 4000 to 6000. Assuming that the population grows exponentially, how large will the colony be after 30 days?

5. Suppose that \$5000 is invested at 8% interest. Find the balance in the account after 5 years if the interest is compounded

(a) (5 pts.) monthly, and

(b) (5 pts.) continuously.