

OPTIMIZATION & MODELING  
Questions for AB Calc. Sheet # 450

NAME: \_\_\_\_\_

Period: \_\_\_\_\_

1) A company that produces MP3 players estimates that the profit  $P$  in dollars for selling a particular model is given by  $P = -76x^3 + 4830x^2 - 320,000$ , where  $0 < x < 60$ , and  $x$  is the advertising expense in tens of thousands of dollars. Find the advertising expense that will yield the greatest profit. What is the maximum profit?

2. A rectangular package to be sent by a delivery service can have a maximum combined length and girth (perimeter of a cross section) of 120 inches. If the package has a square base, with a side of  $x$  inches, and its height is  $y$  inches, find the following:

- A) An equation for the volume of the package
- B) The approximate dimensions that will yield a maximum volume.

3. The ordering and transportation cost  $C$ , in thousands of dollars, for the components used in manufacturing a particular product is given by

$$C = 100 \left( \frac{200}{x^2} + \frac{x}{x + 30} \right), x > 1$$

where  $x$  is the order size in hundreds. What is the optimal order size? Briefly explain your answer.

4. The game commission introduces 100 deer into newly acquired state game lands. The population  $N$ , of the herd is modeled by

$$N = \frac{20(5 + 3t)}{1 + 0.04t} \quad t > 0$$

where  $t$  is the time in years. What is the limiting size of the herd as time increases?

5. A rectangular page is designed to contain 48 square inches of print. The margins at the top and bottom of the page are each 1 inch deep. The margins on each side are  $1\frac{1}{2}$  inches wide. What should the dimensions of the page be so that the least amount of paper is used?

