

## Practice problems for Exam 2

1. Suppose the cost in dollars of producing  $q$  items is given by

$$C(q) = 1000q + 2000$$

and the price per item in dollars is given by

$$p = 6000 - 0.5q^2.$$

(A) Find the revenue function  $R(q)$ .

(B) Find the value of  $q$  algebraically that gives a maximum revenue.

(C) Find the maximum revenue.

(D) Find the maximum profit.

(E) Find the marginal profit when  $p = \$50$ .

2. Let  $f(x) = x^2e^{9-x^2}$ .

(A) Find the relative maximum and minimum of  $f$  algebraically

(B) Find where  $f$  is increasing and decreasing.

3. If a CD manufacturer charges  $p(x)$  dollars per CD, where  $p(x) = 10 - \frac{x}{4}$ , then  $x$  thousand CDs will be sold.

(A) Find an expression for the total revenue from the sale of  $x$  thousand CDs.

(B) Find the value of  $x$  that leads to maximum revenue.

(C) Find the maximum revenue.

4. The total profit from selling  $x$  books is

$$P(x) = \frac{5x - 6}{2x + 3}.$$

(A) Find the average profit function.

(B) Find the marginal average profit function.

(C) Find the maximum average profit.

5. Find the elasticity of demand (E) for the given demand function

$$q = -\frac{\ln\left(\frac{p}{400}\right)}{0.2}$$

at  $p = \$2$

Determine whether the demand is inelastic, elastic, or neither.

6. A paint company has a steady annual demand for 24,500 cans of automobile primer. The comptroller for the company says that it costs \$2 to store one can of paint for 1 year and \$500 to set up the plant for the production of the primer. Find the number of cans of primer that should be produced in each batch, as well as the number of batches per year, in order to minimize total production costs.

7. A large pharmacy has an annual need for 480 units of a certain antibiotic. It costs \$3 to store one unit for one year. The fixed cost of placing an order amounts to \$31. Find the number of units to order each time, and how many times a year the antibiotic should be ordered.

8. Suppose the cost in dollars of producing  $q$  items is given by

$$C(q) = 100 - 5q + \frac{1}{60}q^3.$$

Find the minimum cost.

9 Find the derivative of the following functions.

(A)  $f(x) = 7x^3 - 2x + e^x + 3$

(B)  $g(x) = x \ln(x^2 + 4)$

(C)  $h(x) = (3x + e^{-4x})^5$

(D)  $k(t) = \frac{te^t + 1}{t + 5}$