MATH 104 TUTORIAL
Applications of the Derivatives

Q1. <u>Profit</u>

For a monopolist, the cost per unit of producing a product is 3$, and the demand equation is

$$p = \frac{10}{\sqrt{q}}$$

What price will give the greatest profit?

Q2. <u>Profit</u>

For a monopolist's product, the demand equation is
$$p = 42 - 4q$$
and the average-cost function is

$$\overline{c} = 2 + \frac{80}{q}$$

Find the profit-maximizing price.

Q3. <u>Profit</u>

A manufacturer can produce at most 120 units of a certain product each year. The demand equation for the product is
$$p = q^2 - 100q + 3200$$
and the manufacturer's average-cost function is
$$\overline{c} = \frac{2}{3}q^2 - 40q + \frac{10000}{q}$$
Determine the profit-maximizing output q and the corresponding maximum profit.

Q4. <u>Profit</u>

For XYZ Manufacturing Co. total fixed costs are $1200, material and labor costs combined are $2 per unit, and the demand equation is

$$p = \frac{100}{\sqrt{q}}$$

What level of output will maximize profit? Show that this occurs when marginal revenue is equal to marginal cost. What is the price at profit at profit maximization?

Q5. <u>Revenue</u>

The demand equation for a monopolist's product is $p = -5q + 30$. At what price will revenue be maximized?

Q6. <u>Revenue</u>

A real-estate firm owns 100 garden-type apartments. At $400 per month, each apartment can be rented. However, for each $10 per month increase, there will be two vacancies with no possibility of filling them. What rent per apartment will maximize monthly revenue?

Q7. Revenue
A TV cable company has 4800 subscribes who are each paying $18 per month. It can get 150 more subscribes for each $0.5 decrease in the monthly fee. What rate will yield maximum revenue, and what will this revenue be?

Q8. Cost
A manufacturer has determined that, for a certain product, the average cost is given

$$\overline{c} = 2q^2 - 36q + 210 - \frac{200}{q}$$

where $2 \leq q \leq 10$.

  a) At what level within the interval [2,10] should production be fixed in order to minimize total cost? What is the minimum total cost?
  b) If production were required to lie within the interval [5,10], what value of q would minimize total cost?

Q9. Average Cost
The total cost of producing q cases of stockings is given by

$$c = 3q^2 + 50q - 18q \ln q + 120$$

Find the number of cases that should be processed in order to minimize the average cost per case. Determine this minimum average cost.

Q10. Average Cost
If $c = 0.01q^2 + 5q + 100$ is a cost function, find the average-cost function. At what level of production q is there a minimum average cost?