Business, Economics, and Medical Applications

1. Find the number of units x that produce a maximum revenue R
(similar to p.212 #2)

$$R = 1500x^2 - x^3$$

2. Find the number of units x that produces the minimum average cost per unit
(similar to p.212 #6)

$$C = 0.001x^3 + 2x + 16$$

$$Note: \overline{C} = \frac{C}{x}$$

3. Find the price that will maximize profit for the demand and cost functions, where p is the price, x is the number of units, and C is the cost.
(similar to p.212 #9)

Demand Function	Cost Function
p = 80 – x	C = 200 + 40x

$$Note:$$
$$P = R - C$$
$$P = xp - C$$

4. Find the point of diminishing returns given the profit function
(similar to p.212 #17)

$$P = \frac{1}{6}x^3 - 5x^2 + 2x + 20$$

5. Maximum Revenue
(Similar to p.213 #21)

When a product costs $20 per unit, sales are 400 units per week. After a $10 increase, sales fell to 350 units per week. If the demand function is linear, what price per unit will yield a maximum total revenue?

Hint: R = xp

6. Medical Science

The velocity of the air during a cough is modeled by:

$v = k(R - r)r^2$, $\frac{1}{2}R \leq r < R$

k = a constant

R = normal radius of trachea

r = radius of trachea during a cough

Find the r that will maximize the velocity

7. Medical Science

The concentration C(t) in mg per cc of a certain drug is given by the formula:

$$C(t) = \frac{0.02t}{(t+3)^2}$$

$t = \text{number of hours after drug was taken}$

How many hours after the drug was taken will the concentration be at a maximum, and what will be the maximum concentration?

8. Elasticity (Similar to p.213 #27-32)

Find the price elasticity of demand for the demand function at the indicated x-value. Is the demand elastic, inelastic, or of unit elasticity at the indicated x-value? Identify the intervals of elasticity and inelasticity.

$P = 500 - 2x$, $x = 50$

Price Elasticity of Demand

$$\eta(\text{eta}) = \frac{p/x}{dp/dx}$$

elastic when $|\eta| > 1$

inelastic when $|\eta| < 1$

unit elastic when $|\eta| = 1$