Math 1525: Lab 8 (Derivative Work Sheet) Spring 2002

This lab worksheet will give you simple applications of the derivative in business, introduce you to new business terms, and give you some practice in the basic derivative rules.

Problems to Turn In:

Instructions: For this worksheet, you may carefully write up your answers neatly by hand if you wish to do so. You should, however, be sure to attach any standard lab cover sheet to you worksheet. Give answers for problems 1 – 4 in complete sentences. Be sure to use appropriate units and correct notation. For all problems assume that price, cost, revenue, and profit are in dollars and the quantity is in units.

1) If the cost equation is $C(q) = 3000 + 20q + 0.03q^2$, find the rate of change in cost with respect to quantity (this is also called marginal cost) when q = 50 units are produced.

2) The demand equation for a certain product is q = 5000 – 100p where p is the price and q is the quantity demanded at that price. Find the rate of change in **revenue** with respect to price, p. Evaluate for p = 8. (**Note:** We **do not** use the term "marginal" here since the derivative is in terms of price and not quantity.)

3) If profit is $P(q) = q^3 - 5q^2 + 7q$, find the rate of change in profit with respect to quantity (also called marginal profit) for the quantity q = 12.

4) If $C(q) = 200 + 2q + q^2$ is the cost equation and R(q) = 32q is the revenue equation for a certain product, complete each of the following:
   a) Find the marginal cost equation.
   b) Find the marginal revenue equation.
   c) Find the profit equation.
   d) Find the marginal profit equation.
   e) Find the value of q for which marginal profit = 0.
   f) Find the profit when marginal profit = 0.
   g) For what value of q does maximum profit occur?
   h) Find cost for q = 10.
   i) Find marginal cost for q = 10.
   j) Can you use h) and i) to guess the cost for 11 items? Also use the cost equation to evaluate the actual answer and then compare it with your guess. (This method of guessing is called marginal analysis.)

5) Find the derivative of each of the following. For each problem, you should state the function first, followed by its derivative. Be sure to use correct derivative notation.

   (a) $y = 6x - 5x^3 + 9x^2 + 5$, find $\frac{dy}{dx}$.

   (b) $y = 5\sqrt[4]{x^3} + x^3$, find y'.

   (c) $f(x) = -2x^{-4} + x^{-3}$, find $f'(x)$.

   (d) $y = x^{3/2} + 4x^{1/2}$, find $\frac{dy}{dx}$.

   (e) $p = \frac{2}{r^6}$, find $\frac{dp}{dr}$.

   (f) $k = 6\ln(f)$, find $\frac{dk}{df}$.

   (g) $m = 4e^k$, find m'.

   (h) $F(x) = 7^x$, find $F'(x)$.

   (i) $y = 10e^0$, find $\frac{dy}{dx}$.

   (j) $R = e^{\pi}$, find $\frac{dR}{dp}$.