Assignment 11

Solutions to all the following problems (except the Practice Problems) should be written up and handed in to your TA.

Due in recitation on Thursday, April 11, 2002

Walker:
- Section 5.6: Problems 2, 4, 5, 6
- Section 6.1: Problems 1, 2, 4
- Section 6.2: Problems 1

Stewart:
- Section 14.8: Problems 1, 4

Some Practice Problems: You do not need to hand in the solutions to the following problems.

1. For a certain automated manufacturing process, machines M and N are used for \( m \) and \( n \) hours, respectively. The daily output \( Q \) is related to \( m \) and \( n \) in the following way:

\[
Q = 4.5m + 5n - 0.5m^2 - n^2 - 0.25mn.
\]

Find the values of \( m \) and \( n \) that maximize the daily output.

2. Snagim, Inc. has a monopoly on two competing products: Gotchas (denoted by \( G \)) and Stukyas (denoted by \( S \)). The demand equations for Gotchas and Stukyas are respectively

\[
\begin{align*}
p_G &= 35 - 2q_G^2 + qs \\
p_S &= 20 - qs + q_G
\end{align*}
\]

The total cost function is

\[
c = -8 - 2q_G^3 + 3q_Gq_S + 30q_G + 12q_S + \frac{1}{2}q_G^2.
\]

(a) How many units of Gotchas and Stukyas should the monopolist sell in order to obtain a local maximum in profit?

(b) What should the selling prices be so that the local maximum in profit is realized? What is the local maximum in profit?
3. A candy company produces two varieties of candy, A and B, for which the constant average costs of production are 60 and 70 (cents per pound), respectively. The demand functions for A and B are given by

\[ q_A = 5(p_B - p_A) \]
\[ q_B = 500 + 5(p_A - 2p_B). \]

Find the selling prices \( p_A \) and \( p_B \) that maximize profits.

4. A grocer sells two brands of coffee, A and B. Brand A costs the grocer $2 per pound, while brand B costs only $1 per pound. The grocer determines that the demand functions for the coffee are given by

\[ q_A = 30 - 5p_A + p_B \]
\[ q_B = 40 - 4p_B + p_A. \]

At what selling prices is profit maximized? What is the maximum profit?