

21-256 Multivariate Analysis and Approximation

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:

$$Q = 4.5m + 5n - .5m^2 - n^2 - .25mn.$$

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 Stukyias (denoted by S). The demand equations for Gotchas and Stukyias are respectively

$$p_G = 35 - 2q_G^2 + q_S$$

$$p_S = 20 - q_S + q_G$$

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 Stukyias 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

$$\begin{aligned}q_A &= 5(p_B - p_A) \\q_B &= 500 + 5(p_A - 2p_B).\end{aligned}$$

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

$$\begin{aligned}q_A &= 30 - 5p_A + p_B \\q_B &= 40 - 4p_B + p_A.\end{aligned}$$

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