Math 220 Quiz 10 ______________________________

1. A company manufactures two types of athletic shoes: jogging shoes and cross-trainers. Total monthly revenue from x units of jogging shoes and y units of cross-trainers is given by $R(x, y) = -5x^2 - 8y^2 - 2xy + 42x + 102y$, where x and y are in thousands of units. In a month it has to turn out 10,000 pairs of shoes in all. Using Lagrange multiplier method, find the values of x and y to maximize the total revenue. Watch the units!

2. The manager of a bookstore determines that when a certain new paperback novel is priced at p dollars per copy, the daily demand will be $q = 300 - p^2$ copies.

a. What is the domain (the possible values of p) of this function?

b. Write the elasticity function for this scenario.

c. Using $E(p)$, find the price at which there will be unit elasticity.

d. If the price charged is less than what you found in (c), what would a small increase in price do to revenue? Justify your answer using the formula that relates E and R.

3. A company has determined that its annual production level is given by the Cobb-Douglas function $f(x, y) = 2.5x^{0.45}y^{0.55}$ where x represents the total number of labor hours in 1 year and y represents the total capital input for the company. Suppose 1 unit of labor costs \$40 and 1 unit of capital costs \$50. Use the method of Lagrange multipliers to find the maximum production level of $f(x, y) = 2.5x^{0.45}\,y^{0.55}$ subject to a budgetary constraint of \$500,000 per year.

TIP: Don't multiply or divide values until the end. Reduce as you go along.

HINT: The solution (x = units of labor, y = units of capital) has whole numbers on the order of thousands.