Final Exam

You have until 3:30pm to complete the exam, be certain to use your time wisely. Answer all questions directly on the exam. You must show all of your work to receive full credit. Calculators may be used although you may leave answers as fractions. Unless a problem says otherwise, you can assume that firms can use fractions of units of inputs, produce fractions of units of output and charge non-integer prices (so a firm could use 28.6 units of input to produce 82.4 units and sell at a price of $5.325 per unit). Remember to put your name on the exam. Good luck!

Name: **ID Number:**

1. (20 points) A monopolist has no fixed costs and constant marginal costs. The firm faces a linear, downward sloping demand curve. Determine how the following three strategies would rank in terms of profits: standard monopoly pricing, using a two-part tariff, using first degree price discrimination. Use three graphs, one for each strategy showing the total profits, and a written explanation to justify your answer.

2. (25 points) There is only one dry cleaning business in Williamsburg. The dry cleaner has the following total cost and marginal cost functions:

$$C(A) = \frac{2}{5}A^2 \tag{1}$$

$$MC(A) = \frac{4}{5}A \tag{2}$$

where A is the total number of articles of clothing cleaned. Demand for dry cleaning in Williamsburg is given by the following demand function:

$$D(p) = 200 - 10p \tag{3}$$

where $D(p)$ is the number of articles of clothing people will get cleaned if the price per article is p.

(a) Assuming that the dry cleaner cannot use any forms of price discrimination, what price will the dry cleaner charge and what profits will the dry cleaner make?

(b) What is the socially efficient level of dry cleaning, A_{eff}?

(c) Calculate the deadweight loss generated by the dry cleaner acting as a monopolist.

(d) Suppose that Williamsburg decides to force the dry cleaner to provide the efficient level of dry cleaning. Would the dry cleaner agree to do this or would the dry cleaner rather go out of business? Be certain to fully justify your answer.

3. (20 points) There are three identical farmers (A, B and C) that all sell zucchini at the farmers market. Each farmer decides how many zucchini he will bring to the farmers market. The market price for zucchini is then determined by the price consumers are willing to pay for the total amount of zucchini available ($Z_A + Z_B + Z_C$). The inverse market demand curve for zucchini is given by:

$$p(Z) = 6 - \frac{1}{90}Z \qquad (4)$$

Each farmer has no fixed costs and constant marginal costs equal to \$2.

(a) Write down an equation giving farmer A's profits as a function of farmer A's number of zucchini and the number of zucchini brought by farmers B and C ($\pi_A(Z_A, Z_B, Z_C)$).

(b) Given your profit function in part (a), find farmer A's optimal number of zucchini as a function of the number of zucchini being brought by farmers B and C ($Z_A(Z_B, Z_C)$).

(c) Using the best response function you found for farmer A in part (b), find the equilibrium number of zucchini brought by each farmer. (Hint: Recognizing that all three farmers are identical makes this much easier.)

(d) What is the efficient number of zucchini? Is this the same as the total number of zucchini provided in equilibrium?

4. (15 points) Two roomates, Alex and Bob, are deciding how much to spend on the couch for their living room. They will share the couch and each roommate's enjoyment of the couch is independent of how much the other roomate uses the couch. Alex has a posivite but diminishing marginal benefit from couch quality given by:

$$MB_A(Q) = 200 - Q \tag{5}$$

where Q is the overall couch quality. Bob also has a positive and diminishing marginal benefit from couch quality given by:

$$MB_B(Q) = 100 - \frac{1}{2}Q \tag{6}$$

Higher quality couches cost more money. For every increase in couch quality by one unit, the price of a couch goes up $5.

(a) If Alex were buying a couch for himself, how much will he spend on the couch?

(b) Suppose that Alex says he will pay the amount you find in part (a) for the shared couch. Assuming Alex keeps his promise, how much additional money will Bob be willing to pay for the shared couch?

(c) Will the payments in part (b) lead to the efficient couch quality? Be certain to fully explain your answer including your calculation of the efficient couch quality.

5. (20 points) Planting flowers in my garden is costly to me but I benefit from having a nicer looking garden. Every extra flower I plant increases my costs by \$10. This includes both the costs of buying the flowers and the costs of my time. For every extra flower I plant, the amount of enjoyment I get from my garden increases by an amount that depends on how many flowers, F, have already been planted. This marginal benefit from planting another flower is given by:

$$MB(F) = 100 - F \tag{7}$$

My neighbors do not incur any costs from me planting flowers but they do receive benefits from looking at a nicer garden. The benefits my neighbors get from an additional flower are half as big as the benefits I get. Draw a graph with the number of flowers on the horizontal axis that shows the items listed below. Label all intercepts, slopes and points of intersection with their numerical values:

- The marginal costs of planting an additional flower, $MC(F)$.
- My private marginal benefits from planting an additional flower, $MB_{private}(F)$.
- The social marginal benefits from planting an additional flower, $MB_{social}(F)$.
- The number of flowers I will choose to plant, F^*, if I am maximizing my individual surplus.
- The deadweight loss associated with my choice of F^*.
- The size of the subsidy per flower, S, that would lead me to choose the socially efficient number of flowers.