73230 Intermediate Microeconomics
Practice Questions for Final Exam

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Problem 1 - Utility Maximization

Consider a consumer whose utility funciton is given by $u(x_1, x_2) = \min(x_1, 3x_2)$. The price of good 1 is $p_1 = \$6$, the price of good 2 is $p_2 = \$4$. The consumer has \$180 to spend.

(a) Write down the consumer's constrained optimization problem.

(b) What is the consumer's optimal consumption bundle? Illustrate your answer on a graph.

(c) Assume that the price of good 1 has increased to $p_1' = \$24$. Find the new optimal consumption bundle and decompose the total effect from the price change into the income effect and the substitution effect. Illustrate your answer on a graph.

(d) How would your answers to (a)-(c) change if the utility function is $u(x_1, x_2) = x_1 + 3x_2$. What if the utility function is given by $u(x_1, x_2) = \sqrt{x_1 x_2}$.

Problem 2 - Labor Supply

Sadio chooses the number of hours for work, and he has in total 2400 hours per year to either work or spend time with his family. His utility over consumption (C) and hours spent with his family (L) is $u(C, L) = C^{1/2}L$. The price of consumption is \$1/unit, and the hourly wage is \$$w$. Sadio is being taxed 20% of his hourly wage. Derive Sadio's labor supply function (i.e., how many hours will Sadio work at wage w).

Problem 3 - Cost Minimization

Let $\bar{K} = 1$ be the level of capital in the short run. The prices of capital and labor are $r = 10$ and $w = 5$. The production function is given by $f(K, L) = KL^{1/2}$.

(a) Derive the firm's short-run cost function. What is the firm's supply curve in the short-run?

(b) Derive the firm's long-run cost function. What is the firm's long-run supply curve?

(c) Does the production function exhibit increasing/decreasing/constant returns to scale? Explain.

Problem 4 - Perfect Competition

For each of the following, what is the industry's long-run supply curve?

(a) Unlimited entry, unlimited exit, and firms have the following long-run cost function:

$$TC(Q) = Q^2 + 10Q \tag{1}$$

(b) The government restricts the number of firms to be at most 20, and firms have the same long-run cost function as in Equation (1).

Problem 5 - Monoply

Consider a monopolist with the following demand:

$$P = 120 - 2Q$$

The monopolist's cost function is given by: $TC(Q) = 2Q^2$.

(a) What are the equilibrium price and quantity? Calculate the deadweight loss due to monopoly power.

(b) Suppose that the monopolist can use first-degree price discrimination, calculate the monopolist's profit.

(c) Suppose that there exists another market with the following demand $P = 120 - Q$.

(i) If the monopolist can use third-degree price discrimination, what are the equilibrium prices and quantities?

(ii) If the monopolist cannot use third-degree price discrimination, what are the equilibrium price and quantities?

Problem 6 - Cournot and Stackelberg

Consider a market in which two firms are producing a homogenous good and competing by simultaneously choosing quantities (i.e., in Cournot style). The market demand is given by

$$P = 100 - 2Q$$

The marginal cost of both firms are $MC_1 = MC_2 = 20$.

(a) Derive firm 1's best response to firm 2's quantity choice, i.e., $q_1(q_2)$.

(b) What are the equilibrium price, quantities, and firms' profits? Compute the deadweight loss.

(c) Suppose now that firm 1 has a first-mover advantage. That is, firm 1 chooses q_1 first, and then firm 2 chooses q_2. Compute the equilibrium price, quantities, and firms' profits in this case. What is the deadweight loss?

(d) Compare the Cournot profits to the Stackelberg profits. Which firm is better off? Which firm is worse off?

(e) How would your answers to (a)-(d) change if the firms were producing differentiated products with the following demands: $P_1 = 100 - 2Q_1 - Q_2$, and $P_2 - 100 - 2Q_2 - Q_1$. *Note: You do not need to calculate deadweight loss for this case.*

Problem 7 - Bertrand

2 firms are producing homogenous goods and compete in a Bertrand competition. The demand is given by $P = 800 - 8Q$.

(a) If $MC_1 = MC_2 = 80$, what are the equilibrium prices and quantities? Calculate each firm's profit and the deadweight loss.

(b) If $MC_1 = 160$, $MC_2 = 80$. Suppose that firms have to price in whole numbers (e.g., $P = 79.5$ is not feasible), what are the equilibrium prices and quantities? Calculate each firm's profit and the deadweightloss.

Problem 8 - Adverse Selection

Consider the market for used cars. A good car ("peach") can break down with probability 10%. A bad car ("lemon") can break down with probability 60%. Consumers' valuation for a fully working car is \$1000 and \$0 for a broken car. Assuming that consumers are risk neutral and consumers pay their expected willingness to pay. The cost of producing a good car is $MC_G = 700$, and the cost of producing a bad car is $MC_B = 500$.

(a) Compute consumers' WTP for peaches and lemons.

(b) If 80% of cars are peaches, what is the equilibrium price? What kind of cars will be sold?

(c) If 80% of cars are lemons, what is the equilibrium price? What kind of cars will be sold?