

Fall 2018 14.01 Problem Set 5

Problem 1: True or False (24 points).

Determine whether the following statements are True or False. Explain your answer.

1. (4 points) A government sets a price ceiling for widgets that is below the equilibrium price. This intervention will always decrease the producer surplus, increase consumer surplus and decrease total surplus.
2. (4 points) A non-discriminating monopoly will optimally choose a price and quantity where the market demand curve is inelastic (i.e. elasticity is lower than one in absolute value).
3. (4 points) If a monopolist charging a uniform price begins to practice perfect price discrimination, some consumers may become strictly better off.
4. (4 points) Transferring a monopolist's profit to consumers eliminates the inefficiency associated with monopoly.
5. (4 points) Martin knows that if he sells 500 widgets, his revenue will be \$1000 and that if he sells 800 widgets, his revenue will be \$1500. The market for widgets is perfectly competitive.
6. (4 points) Suppose that a monopolist initially charging a uniform price, now moves to charging a different price to young and old consumers, but the total quantity sold by the monopolist doesn't change. Claim: total welfare must be lower after the monopolist starts discriminating.

Problem 2 (41 points)

Consider the perfectly competitive market for gasoline. The aggregate demand for gasoline is

$$D(p) = 100 - p$$

while the aggregate supply is

$$S(p) = 3p$$

1. (5 points) Calculate the equilibrium price and quantity. At this equilibrium, compute the consumer surplus, producer surplus and total surplus.
2. (5 points) Suppose now that the government is concerned because many gas stations are going out of business, so it decides to set a minimum price of $\bar{p} = 30$ to help them. What will be the new equilibrium price and quantity with this intervention? Compute the consumer surplus and producer surplus; who gains and who loses from this regulation? How is the total surplus affected? Briefly explain the intuition.
3. (5 points) Suppose now that instead of regulating prices, the government decides it is better to help gas stations by setting quantity regulations. In particular the government sets a quota of $\bar{q} = 70$ (this means that aggregate quantity supplied can't exceed 70 units). What will be the new equilibrium price and quantity with this regulation? How does it compare to the results obtained with the minimum price?
4. (6 points) Suppose now that because of a conflict in the Middle East prices of oil increase, which increases the cost of supplying each unit of gas by $\$x$. Find the minimum value of x such that the regulations discussed above become irrelevant to determine the market equilibrium.
5. (5 points) From this question onward assume that instead of perfect competition, there is a monopolist in this market. Its cost curve is $C(q) = q^2/6$. Assume it sets a uniform price. What price and quantity does the monopolist set? Compute the consumer surplus, producer surplus, total surplus and the deadweight loss in this case. Compare your results to the perfectly competitive case and explain.
6. (5 points) Suppose that the government would like to help the monopolist by setting a minimum price. What price should it set?

7. (5 points) Now suppose that the government wants to set a price ceiling in order to maximize welfare (total surplus). What price should it set and what would be the resulting total surplus?
8. (5 points) If the monopolist were able to practice perfect price discrimination, what quantity would it produce? Compute the consumer surplus, producer surplus, total surplus and the deadweight loss in this case.

Problem 3 (20 points)

A uniform pricing monopolist has a cost function $C(q) = \frac{1}{2}q^2$. It faces a market demand of

$$D(p) = p^{-\mu}, \mu > 1$$

1. (5 points) Calculate the price elasticity of demand.
2. (5 points) Write down the monopolist's profit maximization problem as a function of p . Differentiate with respect to p to find the optimal price.
3. (5 points) What is the markup at the optimal price? What is the optimal price when $\mu = 2$? And when $\mu = 3$? Explain the intuition.
4. (5 points) Graph the marginal revenue, marginal cost, and demand curves, and show the deadweight loss from monopoly pricing in the graph (you don't need to assume any particular value of μ , you can do a qualitative graph).

Problem 4 (15 points)

There are two types of widget consumers in Boston. Type 1 consumers have (aggregate for all type 1) demand given by $Q_1 = 100 - P$. Type 2 consumers have (aggregate) demand given by $Q_2 = 110 - \frac{1}{2}P$. The cost of producing widgets is $TC = \frac{1}{2}Q^2$, where Q is the total number of widgets produced. Assume that the producer of widgets behaves as a monopolist.

1. (7 points) Suppose that the producer cannot distinguish between the two types of consumers. What price will it charge? What is the elasticity of demand at that point?

2. (8 points) Now assume that the monopolist can distinguish between the two types of consumers.
- (a) (5 points) How many widgets will the monopolist sell to each group of consumers and how much will it charge them?
 - (b) (3 points) What are the elasticities of demand at the optimal points for the two types of consumer. Explain.

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