

Intermediate Microeconomics

Fall 2025 - M. Chen, M. Pak, and B. Xu

Problem Set 4: due in class, the week of Dec. 8

1. A monopolist with cost function $c(Q) = \frac{Q^2}{2a}$ faces an inverse demand function given by $P(Q) = \frac{2}{\sqrt{Q}}$.
 - (a) Find the elasticity of demand with respect to price.
 - (b) Assuming that the monopolist uses $MR = MC$ pricing rule, find his profit maximizing price, p^m , and output level, q^m .
 - (c) Find the marginal cost at q^m and calculate the Lerner index.
 - (d) Does the monopolist's market power depend on his cost curve? In particular, does it depend on a ? Is your answer surprising?

2. A monopolist with zero cost, that is $c(q) = 0$, faces two consumers whose demand functions are given below.

$$\begin{aligned}Q_1 &= 10 - P \\Q_2 &= 4 - \frac{1}{2}P\end{aligned}$$

- (a) Suppose the monopolist cannot engage in any price discrimination. Find the firm's optimal pricing strategy.
- (b) Now, assume that price discrimination is possible. Find the monopolist's optimal first degree price-discrimination strategy.
- (c) Find the monopolist's optimal second degree price-discrimination strategy.

3. A monopolist with cost function $c(q) = q$ faces two consumers whose demand functions are given below.

$$Q_1 = 100 - P$$

$$Q_2 = 50 - \frac{1}{2}P$$

- (a) Suppose the monopolist cannot engage in any price discrimination. Find the firm's optimal pricing strategy. Calculate the firm's Lerner index.
 - (b) What is the deadweight loss associated with this pricing strategy, if any?
 - (c) Now, assume that price discrimination is possible. Find the monopolist's optimal first-degree price-discrimination strategy and the associated dead-weight loss.
 - (d) Find the monopolist's optimal third-degree price-discrimination strategy.
4. A monopolist with cost function $c(q) = 20q$ faces two types of customers. The first type's demand is $Q_1 = 850 - 10P$, while the second type's demand is $Q_2 = 1500 - 15P$. Assume that the number of customers is the same for both types.
- (a) Suppose the monopolist engages in third-degree price discrimination. Use the price elasticities of demand to explain that charging type 1 customers 25 RMB and type 2 customers 35 RMB is not optimal.
 - (b) Find the optimal prices for third-degree price discrimination solution for the monopolist.

5. Consider an Edgeworth box economy where preferences are given by

$$u^1(x_1^1, x_2^1) = x_1^1 x_2^1 \quad \text{and} \quad u^2(x_1^2, x_2^2) = x_1^2 + \ln x_2^2,$$

and the initial endowments are

$$e^1 = (0, 1) \quad \text{and} \quad e^2 = (1, 1).$$

Find the Pareto set in terms of x_1^1 . (Be sure to pay attention to the boundary of the Edgeworth box, where slopes of the indifference curves being equal is not necessary for Pareto optimality.)