ECN 594: Midterm Exam

February 9, 2026

Instructions:

- You have **70 minutes**
- You may bring a calculator and notes on a two-sided cheat-sheet (letter-size paper)
- Please be neat. If your work is too messy it will not be graded.
- Be sure to show your working.
- This is a long exam, so there are lots of ways to get points. If you get stuck, move on!
- Good luck!

Name: _____

Question:	1	2	3	4	Total
Points:	30	30	20	20	100
Score:					

1. Short Answer Questions (30 points)

1. For each question, write either:

   - a number or formula
   - one of: True, False, or NEI (Not Enough Information)
   - a brief definition or explanation (one sentence)

   (a) (3 points) A monopolist faces constant elasticity demand with $\varepsilon = -4$ and has marginal cost $c = 15$. What is the optimal price?

   (a) _____

   (b) (3 points) Write the Berry inversion formula that relates market shares to mean utilities in the logit model.

   (b) _____

   (c) (3 points) True, False, or NEI: Adding demographic interactions to a logit model fully solves the IIA problem.

   (c) _____

   (d) (3 points) What is the economic interpretation of the price coefficient α in the logit demand model?

   (d) _____

   (e) (3 points) True, False, or NEI: If marginal cost increases, a monopolist with linear demand will raise price by exactly the same amount as the cost increase.

   (e) _____

   (f) (3 points) True, False, or NEI: Under a two-part tariff, setting the per-unit price equal to marginal cost maximizes total surplus.

   (f) _____

   (g) (3 points) Name one reason why the "BLP instruments" (characteristics of other products) help identify the price coefficient.

   (g) _____

   (h) (3 points) True, False, or NEI: In a self-selection problem, the firm can extract the entire surplus from low-type consumers.

   (h) _____

   (i) (3 points) What is "versioning" in the context of price discrimination?

   (i) _____

   (j) (3 points) True, False, or NEI: Consumer surplus in the logit model can be computed using the log-sum formula, which equals the "inclusive value" divided by $|\alpha|$.

   (j) _____

2. Demand Estimation (30 points)

2. Consider a market with 4 differentiated products. The logit demand model is:

$$u_{ij} = \delta_j + \alpha p_j + \varepsilon_{ij}$$

where $\alpha = -0.4$ is the price coefficient.

The following data are observed:

Product	Price (p_j)	Mean Utility (δ_j)
1	\$15	3.0
2	\$12	2.5
3	\$18	3.5
4	\$10	2.0

(a) (8 points) Compute $v_j = \delta_j + \alpha p_j$ for each product. Then compute the market shares using:

$$s_j = \frac{\exp(v_j)}{1 + \sum_k \exp(v_k)}$$

(b) (6 points) Compute the own-price elasticity for each product. Which product has the most inelastic demand?

(c) (6 points) A researcher estimates demand using OLS (regressing $\ln(s_j) - \ln(s_0)$ on price and product characteristics). Explain why this leads to biased estimates of α. What is the direction of the bias?

(d) (10 points) Using the log-sum formula, compute consumer surplus per consumer. If product 1 is removed from the market, what is the change in consumer surplus?

3. Price Discrimination (20 points)

3. A streaming service has two customer segments: "binge watchers" (B) and "casual viewers" (C). Marginal cost is \$2 per subscriber.

   - Binge watcher demand: $Q_B = 200 - 10P_B$
   - Casual viewer demand: $Q_C = 100 - 10P_C$

   (a) (6 points) The firm can identify customer type through usage patterns. Find the optimal prices under price discrimination by indicators.

   (b) (4 points) Compute total profit under price discrimination.

   (c) (6 points) Suppose the firm cannot distinguish customers. What is the optimal uniform price?

   (d) (4 points) Which group is better off under price discrimination compared to uniform pricing?

4. Self-Selection (20 points)

4. An airline offers two fare classes: Business (B) and Economy (E). There are two types of travelers: executives with high willingness to pay and students with low willingness to pay.

	Willingness to Pay	
Consumer Type	Business Class	Economy Class
Executive (50 travelers)	\$500	\$200
Student (100 travelers)	\$150	\$120

Marginal cost is \$50 for economy and \$100 for business class.

(a) (4 points) If the airline could perfectly identify consumer types, what prices would it charge and what is its profit?

(b) (4 points) The airline cannot identify types but offers both fare classes. Write down the incentive compatibility (IC) constraint that ensures executives buy business class.

(c) (6 points) Find the profit-maximizing prices for business and economy class under self-selection. (Hint: Which IC constraint binds?)

(d) (6 points) The airline considers "damaging" economy class by adding restrictions (no changes, middle seat only). How would this affect the equilibrium? Explain the economic logic.