

ECN 453: Mid-term Exam 2

Instructions:

- You have **70 minutes**
- Please write your final answer in the underlined section provided.
- You may bring a calculator and notes on a two-sided cheat-sheet on 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	30	30	120
Score:					

Short Answer Questions (30 points)

1. Depending on the question, write either:

- a number
- one of: True, False, or NEI (Not Enough Information)
- a definition (i.e. one or a few words)

(a) (3 points) In the cement industry, firms make a capacity choice (for example, they choose how much machinery to invest in) and then compete on price. Which form of competition - out of the ones discussed in class - would be best suited to modeling this market?

(a) _____

(b) (3 points) Suppose there are 100 firms competing under Bertrand competition with demand curve $Q = 500 - p$. Of these firms, 99 have a marginal cost of \$100 and one has a marginal cost of \$98. What is the equilibrium price?

(b) _____

(c) (3 points) Name one solution to the ‘Bertrand Trap’.

(c) _____

(d) (3 points) The Hotelling model with transport costs equal to zero ($t=0$) is equivalent to which form of competition?

(d) _____

(e) (3 points) Suppose two firms are capacity constrained with capacities $k_1 = k_2 = 40$, and total demand is $Q = 300 - p$. What is the equilibrium total quantity under Bertrand competition?

(e) _____

(f) (3 points) True, False, or Not Enough Information: The entry deterrence model discussed in class predicts that the incumbent’s capacity choice increases and then decreases as the entry cost increases.

(f) _____

(g) (3 points) Consider a two-firm Bertrand model where each firm has the same (constant) marginal cost ($=\$10$) and the monopoly price = \$200. If Firm 1 plays $p_1 = \$100$, what is Firm 2’s best response?

(g) _____

(h) (3 points) Consider a two-firm Cournot model where each firm has the same (constant) marginal cost. If Firm 1 plays $q_1 = q^c$, where q^c is the perfect competition quantity, what is Firm 2’s best response?

(h) _____

(i) (3 points) Consider the Cournot model with n identical firms, constant marginal cost, and linear demand. As the number of firms gets very large $n \rightarrow \infty$, what value does the quantity produced by each firm converge to?

(i) _____

(j) (3 points) Consider the Cournot model with n identical firms, constant marginal cost, and linear demand. As the number of firms gets very large $n \rightarrow \infty$, what value does the price converge to?

(j) _____

2. Cournot Competition (30 points)

2. Suppose that total demand in the market for cement is $p = 200 - 2Q$. Firm 1 and Firm 2 are identical with constant marginal cost = 40. The firms compete on quantities (Cournot competition).
- (a) (15 points) If Firm 1 chooses $q_1 = 2$, what is Firm 2's best response?

(a) _____

- (b) (15 points) Determine the equilibrium quantity choices in the Cournot equilibrium.

(b) _____

3. Stackelberg Competition (30 points)

3. There are two firms in a market with total demand $p = 100 - 2Q$. Firm 1 moves first and Firm 2 moves second. Firm 1's total cost is $C(q_1) = 4q_1^2$. Firm 2's total cost is $C(q_2) = 0$.

- (a) (30 points) Suppose that the firms compete in a Stackelberg equilibrium. What is the equilibrium quantity for Firm 1?

(a) _____

4. Hotelling Model (30 points)

4. Suppose 100 consumers are uniformly distributed on a 1 mile stretch of road. There are two supermarkets on the road: Supermarket 1 is located at the west end of the road (at location = 0), and Supermarket 2 is part way along the road (at location = 0.9). Transport costs for consumers are \$0.50 per mile. The supermarkets' marginal costs are 0. The supermarkets compete on prices: denote Supermarket 1's price p_1 and Supermarket 2's price p_2 .
- (a) (15 points) What is the demand for each supermarket?¹

(a) _____

¹When computing consumer choices, only consider the transport costs to get to the supermarket, don't worry about the return journey.

(b) (10 points) If Firm 2 chooses a price $p_2 = 0.2$, what is Firm 1's best response p_1 ?

(b) _____

(c) (5 points) In one sentence explain: if prices are fixed and the supermarkets could relocate, would you expect the supermarkets to move location or to remain in their current locations?