

Answer each of the following questions. Explain all answers and show all work. Partial credit will be given for partially correct analysis. No credit is given for answers without work shown. No notes, books, etc. may be consulted during the exam, and calculators are not needed.

1. (25 pts) Consider a two-period model in which there is a monopoly producer of a durable good. The willingness to pay of consumers for one period's use of the good is given by the inverse demand function $P(q) = 20 - Q$. The good can be produced at zero cost. Firms and consumers have a discount rate of zero (no discounting).

a. Suppose the monopolist can rent the good. What is the profit-maximizing per-period rental rate? What will be the total profit earned by the monopolist?

b. Now suppose the monopolist cannot rent and cannot commit in period 1 to the price that will be charged in period 2. What will be the total profit earned by the monopolist?

2. (27 pts) Suppose market (inverse) demand for oranges is given by the equation $P = 1 - \frac{Q}{1000}$, where P is the price of an orange in dollars. Oranges are only sold from roadside stands. There are two stands, A and B, in this market. Each stand owner (Mr. A and Mrs. B) orders one shipment of oranges from Florida, then sells all of them at whatever price clears the market. There is only one supplier of oranges in Florida, and this happens to be a friend of Mr. A's. Mr. A and Mrs. B have no fixed costs; marginal cost is 28 cents per orange. Assume Mr. A and Mrs. B follow subgame perfect equilibrium strategies in choosing their quantities.

a. Suppose the supplier lets Mr. A choose the number of oranges to order before Mrs. B and that Mrs. B can observe the size of Mr. A's order before making her order. What quantity of oranges will each stand sell? What will be the market clearing price? What will be the profit of each firm? Does Mr. A's friendship with the supplier give him an advantage in this market?

b. After Mrs. B has ordered her oranges, does Mr. A wish he could switch to a different quantity?

c. Now suppose Mr. A calls his friend the supplier and proposed the following arrangement: "I'll call you first and tell you how many oranges I plan to order. You tell this to Mrs. B. But once she's given you her order, you call me back, tell me how many she is ordering, and then I'll give you my revised order. Don't ship anything until then." Assume Mrs. B is aware of this arrangement. What will be the equilibrium quantities sold by each stand? What will be the market price? What profit will each stand make? Why does Mr. A's scheme backfire?

3. (27 pts) Consider a market with inverse demand $P = 100 - 2Q$. Firms have no fixed cost and constant marginal cost c .

a. Derive the firms' quantities and profits when this market is served by Cournot duopolists.

b. What will firm profits be in Nash equilibrium if there are n Cournot competitors?

c. Now suppose there is a fixed cost f of entering this market and that there is free entry. Ignoring the integer constraint, solve for the equilibrium number of Cournot competitors. Provide intuition for why this equilibrium number of firms differs from the socially optimal number of firms (a couple of sentences will do).

4. (21 pts) Suppose an industry consists of 2 firms that compete by choosing prices simultaneously in each period $t = 1, 2, \dots$. Inverse demand in the industry is given by the equation $P = 10 - \frac{Q}{2}$. Marginal cost is 2, and there are no fixed costs. All firms discount future profits using the per-period discount factor δ . How large must δ be for there to be a subgame perfect equilibrium in which the industry makes the profit a monopolist would?