

310-2 Yossi Spiegel

Review problems

Problem 1

Consider an industry with 3 price-setting firms that produce differentiated products at 0 cost. Assume that the demand that firm i faces is

$$q_i = 100 - 3p_i + \sum_{j \neq i} p_j, \quad i = 1, 2, 3,$$

where p_i denotes the price charged by firm i .

- (a) Write out the payoff of firm i as a function of the prices charged by the 3 firms.
- (b) Compute the Nash equilibrium prices (hint: the equilibrium is symmetric). Compute the equilibrium profits of the 3 firms.
- (c) Now suppose that firm 1 choose p_1 before firms 2 and 3. After observing p_1 , firms 2 and 3 choose their respective prices simultaneously. Compute the subgame perfect equilibrium of this game and compute the equilibrium profits.
- (d) Compare your answers in (b) and (c). Can you explain the intuition for the result?

Problem 2

Two quantity-setting firms produce a homogenous good with zero costs. Let x_i , $i = 1, 2$ be the quantity produced by firm i , and assume that the inverse demand function is $P(X) = A - (x_1 + x_2)$.

- (a) Show the best response functions of the two firms on a graph, compute the Nash equilibrium of the game, and show it on the graph.
- (b) Compute the output that the two firms would produce if they merged and became a monopoly.
- (c) Suppose that the two firms collude by agreeing that each should produce half of the monopoly output. Show this agreement on the graph. Is the agreement self-enforcing? Explain your answer (hint: you should check whether producing half of the monopoly output is a best-response against a rival who produces half of the monopoly output).

Problem 3

Consider two quantity-setting firms that produce a homogeneous good. The inverse demand function for the good is $p = A - (x_1 + x_2)$, where x_i , ($i = 1, 2$) is the output of firm i . The cost function of firm 1 is $C_1 = x_1$ and the cost function of firm 2 is $C_2 = 2x_2$.

- (a) Compute the Nash equilibrium when the two firms choose their quantities simultaneously.
- (b) Compute the subgame perfect equilibrium of the game in which firm 1 chooses its quantity before firm 2.
- (c) In the equilibrium you computed in (b), does firm 1 play a best response against the equilibrium quantity of firm 2? Explain your answer.
- (d) Compute the subgame perfect equilibrium of the game in which firm 2 chooses its quantity before firm 1.
- (e) Compare your answers in (a), (c), and (d). Which situation is best from the point of view of consumers?