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Office hours: Tuesday 9:30am-11:30pm, or by appointment.

Exercises (Midterm Preparation): This midterm preparation is a guide that will help you to study for Midterm #1. *It does not imply that you will face the same questions during the exam.* The midterm will be mainly focused on Chapters #2, 3, 4, 5, 6 and 7.

1. What externality is generated when one firm cheats on a cartel output agreement by increasing output beyond the agreement level?
2. How can an elastic demand curve deter the formation of a cartel?
3. Consider an industry consisting of a cartel of three firms and a single price-taking outside firm. Would the following changes make it easier or more difficult to maintain the cartel agreement, and why?
 - (i) an increase in the elasticity of market demand
 - (ii) entry by a second non-member firm, reducing the cartel's share of industry output
 - (iii) an increase in the elasticity of the non-member firm's supply curve
4. An industry consists of 11 identical firms with costs $c(q) = 4q + q^2$. Market demand is $Q = 100 - p$. What are the equilibrium price, output and profits of each firm if all eleven participate in a cartel? If a single firm cheated, what would its output and profits be, assuming the other firms maintain the cartel price?
5. An industry consists of two firms with identical costs $C(q) = 5q + q^2/2$. The firms can either "collude" or "compete." If both collude, they each produce q_m (half the monopoly output Q_m). If one firm colludes and the other competes, the latter produces the output q^c that maximizes its profits given that the other firm produces q_m . If both compete, they play Cournot and each produce q_n . Calculate these outputs and the resulting profits if market demand is $Q = 125 - p$. Represent your results as a normal-form game. What is the Nash equilibrium if the game is only played once?
6. Explain in words (a paragraph and perhaps a diagram should suffice) why in a monopolistically competitive equilibrium with homogeneous goods the industry produces too little output.
7. Why is a firm in a perfectly competitive market called a price taker?
8. The market is supplied competitively by 50 low-cost firms, each with cost curve $C_l(q) = 350 + 2q + q^2$, and n high-cost firms, each with cost curve $C_h(q) = 400 + 2q + q^2$. Market demand is $Q = 2500 - 10p$. If none of the high-cost firms makes a positive profit, how large is n ? How much profit do the low-cost firms make?
9. The following markets are not likely to be characterized by perfect competition. In each case, give the most likely reasons why. (i) used cars (ii) diamonds (iii) motion pictures
10. An econometrician estimates the relationship $q_1 = \alpha_0 + \alpha_1 p_1 + \alpha_2 p_2$ where q_1 is the demand for a product, α_1 is the effect on that demand of a unit change in the price p_1 of the product itself, and α_2

is the effect of a unit change in the price p_2 of a rival product. It is found that α_1 and α_2 are significantly different from zero, but insignificantly different from each other. What does this suggest about the appropriate model for analyzing the market for these products, assuming there is free entry into that market?

11. In the Bertrand model with product differentiation, suppose that the two Bertrand firms face the following symmetric demand curves:

(i) $q_1 = 96 - 2p_1 + 1/2 p_2$

(ii) $q_2 = 96 - 2p_2 + 1/2 p_1$

Where $q_1, q_2 > 0$ and $p_1, p_2 < 48$. Find the Bertrand equilibrium.

12. The short-run supply of a certain crop is perfectly inelastic, because it has already been harvested and no more of it can be grown until the next growing season. In order to raise the price received by farmers, the government orders the destruction of a percentage of the harvest. Does this action result in a deadweight loss? Why or why not? Assume that the cost of distributing the crop to consumers is zero.

13. Cereals producers X and Y produce and sell substitute cereals (differentiated goods). The inverse demand functions for cereals X and Y, respectively, are given by $p_X = 60 - (3/2)q_X - q_Y$ and $p_Y = 60 - (3/2)q_Y - q_X$. Assuming that firms do not bear any production costs ($c_X = c_Y = 0$), answer the following questions:

- Suppose the firms compete in quantities, where firm X sets q_X and firm Y sets q_Y , simultaneously. Formulate the profit function of each firm as a function of the quantity supplied by both firms. Formally, write down and spell out the exact equations of each firm's maximization problem.
- Solve for the firms' quantity best-response functions $q_X = R_X(q_Y)$ and $q_Y = R_Y(q_X)$. Plot both best-response functions where you denote the vertical axis by q_X and the horizontal axis by q_Y . Indicate whether these best-response functions are upward or downward sloping.
- Solve for the Nash equilibrium quantity levels, q_X and q_Y , the corresponding prices, p_X and p_Y , as well as the equilibrium profit levels, π_X and π_Y .
- Solve for the two direct demand functions from the above-given system of two inverse demand functions. Formally, compute the parameters a , b , and c of the direct demand functions $q_1 = a - bp_1 + cp_2$ and $q_2 = a - bp_2 + cp_1$, which are consistent with the above-given inverse demand functions.
- Suppose now that firms compete in prices, where firm X sets p_X and firm Y sets p_Y , simultaneously. Formulate the profit function of each firm as a function of both prices. Formally, write down and spell out the exact equations of each firm's maximization problem.
- Solve for the firms' price best-response functions $p_X = R_X(p_Y)$ and $p_Y = R_Y(p_X)$. Plot both best-response functions where you denote the vertical axis by p_X and the horizontal axis by p_Y . Indicate whether these best-response functions are upward or downward sloping.
- Solve for the Nash equilibrium prices, p_X and p_Y , the corresponding quantities, q_X and q_Y , as well as the equilibrium profit levels, π_X and π_Y .
- Compare with Nash equilibrium of the quantity game to the Nash equilibrium of the price game with respect to the quantity produced, prices, and profit levels. Explain these differences.

SOLVE THE EXERCISES OF THE TEXTBOOK!!! ☺