

## Quizzes before the Midterm, 2021

ECON 433

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14 September, 2022

1. Consider a world where there are two firms (1 and 2) each of them who have  $C(q) = 10q_i$  for  $i \in \{1, 2\}$ . The inverse demand curve is given by  $P = 16 - Q$  where  $Q$  is the market quantity.
2. (9 points total) (Cournot Oligopoly) Each firm chooses  $q_i$  and  $Q = q_1 + q_2$ .
  - (a) (2 points) Set up the objective function of firm 1.
  - (b) (4 points) Find the best response.
  - (c) (3 points) Find the equilibrium quantities of both firms, the total quantity, and market price. **NOTE:** I have told you three different ways to do this.
3. (9 points total) (Bertrand Oligopoly) Now the two firms choose price,  $p_i$ , **which must be an integer**. The market price,  $P$  is the minimum of the two firm's prices. Customers always buy from the lower price firm, and if both firms charge the same price split their demand between the two firms.
  - (a) (6 points) For all  $p_2$ , find the best response(s) for firm one. Be sure to be careful when  $p_2 = 10$ ,  $p_2 < 10$  and  $p_2$  is very high.
  - (b) (3 points) Find the Nash equilibria of this game.
4. (8 points) List two of the four reasons for natural market power discussed in class, explain each one and give an example of an industry where it is an important factor. You may use the same industry more than once.
5. (10 points) Derive the Lerner index for a Monopoly firm with the inverse demand curve  $P(Q)$  (with  $P' < 0$ ) and the cost function  $C(Q)$  (with  $C' > 0$ ). What are the bounds for the Lerner Index? Why do we not use this structural measure to assess market concentration? Name and give the formula for two distinct alternative measures that are commonly used instead.
6. (19 points total) Consider an industry with two firms that compete by choosing quantity, the price is then set at the market clearing price (Cournot Competition). The inverse demand curve is  $P = 30 - Q$ , where  $Q = q_1 + q_2$ , and  $c_1(q) = 21q_1$ ,  $c_2(q) = 15q_2$ .
  - (a) (2 points) Set up the objective function of both firms (to be clear, you need two *separate* objective functions.)
  - (b) (6 points) Find the first order conditions and best responses for both firms.

- (c) (*6 points*) Find the total output and the output of each firm two different ways.  
Now a third firm is entering the industry, with  $c_3(q) = 14q_3$  and now  $Q = q_1 + q_2 + q_3$ .
- (d) (*2 points*) Set up the objective function of firm three and find it's first order condition.
- (e) (*3 points*) Find the total output produced assuming all three firms produce, and then verify that one of the firms does *not* produce output, which one is it?