

Intermediate Microeconomics

Econ 3101, Section 003

Homework 3

Timothy Lim Uy

Question 1. *Monopoly.*

Consider a monopolist with the total cost function

$$TC(Q) = \frac{Q^2}{2} + 10Q + 20 \tag{1}$$

facing the market demand equation $Q = 70 - P$.

- (a) [10] What is the profit-maximizing output and price for the monopolist? Calculate its profit.
- (b) [5] What is the socially optimal output and price for this firm?
- (c) [5] What is the deadweight loss generated by the monopolist?
- (d) [5] Now suppose there are no taxes and the firm is a perfect price-discriminating monopolist. Calculate equilibrium output and quantity.
- (e) [10] Is there any deadweight loss in the case presented in part (d)? How is it different from the perfectly competitive outcome? (Hint: Think about who gains and loses as a result of these different market structures.)

Question 2. *Oligopoly.*

Let market demand be given by $P = 100 - Q$, and suppose the only two firms in the market have the following cost functions: $TC(y_1) = 20y_1$ and $TC(y_2) = 20y_2$.

- (a) [10] Find the Cournot-Nash equilibrium.
- (b) [5] What is the market price and profits of the firms under Cournot-Nash equilibrium?
- (c) [15] Suppose now the two firms collude and form a cartel. Find the market price, total output, and joint profit of the cartel.
- (d) [5] Now suppose the first firm cheats while the second firm doesn't. What is the first firm's profit-maximizing output and how much profit does it make?
- (e) [5] What if the second firm cheats instead (while the first firm doesn't)? How much output will it produce? Calculate the resulting profit.
- (f) [10] Consider the scenario given in part (e). Firm 1 discovers firm 2 cheating and decides to punish it by following suit (so that both firms go down together). What will be the market price and profit made by each firm?
- (g) [15] Now suppose instead that the first firm sets its quantity first and the other firm follows. Find the quantities produced by each firm, the market price, and the firm's profits.