

Economics 251

Homework #4

Due Tuesday June 5 at 6 p.m. (You can turn the homework in during class, in my mailbox on the fourth floor in Krannert, or at my office in Krannert 406.)

20 points

1. (3 points) For the duopoly game with 13 different output levels, find the profit function for Firm 1. To do this, use the inverse demand function

$$\begin{aligned} p &= D^{-1}(q_1, q_2) \\ &= 30 - (q_1 + q_2) \end{aligned}$$

to form the Firm 1 revenue function

$$R_1(q_1, q_2) = D^{-1}(q_1, q_2) q_1$$

and use the cost function $C_1(q_1) = 6q_1$ to form the profit function $\pi_1(q_1, q_2) = R_1(q_1, q_2) - C_1(q_1)$.

2. (1 point) Calculate the profit for Firm 1 for outputs between 3 and 5, assuming that Firm 2 produces 3 units. Compare your answers to the numbers from the table. (The payoff table is posted to the web site right below the problem set.) Why do the profits of firm 1 increase when their output increases and then eventually decline?
3. (1 point) Calculate the profit for Firm 1 for output 3, assuming that Firm 2 produces 4 units and then assuming that Firm 2 produces 5 units. Compare your answers to the numbers from the table. Why do the profits of firm 1 decline when the output of firm 2 increases?
4. (3 points) Using the payoff table, trace out the best-response dynamic starting from the output levels $q_1 = 15$ and $q_2 = 3$.

Problems 5 through 8 are based on the lecture notes on monopoly and duopoly.

5. (3 point) For the monopoly market with

$$\begin{aligned} p &= D^{-1}(q) \\ &= 45 - q \end{aligned}$$

and $MC(q) = 3 + q$ we found the monopoly price and quantity in the lecture notes. Use this information and the definitions of consumers' and producer's surplus for monopoly to find their surplus.

6. (3 point) Suppose that a competitive market has the demand function

$$\begin{aligned}q &= D(p) \\ &= 45 - p\end{aligned}$$

and the market supply $q = S(p) = p - 3$. Graph the demand and supply and compare it to the inverse demand and the marginal cost from the monopoly problem in the lecture notes. How do the surplus measures for consumers and for producers in the competitive market compare to those measures that you found in problem 5 for consumers and the producer in the monopoly market?

7. (3 point) For the monopoly market with

$$\begin{aligned}p &= D^{-1}(q) \\ &= 45 - q\end{aligned}$$

and $MC(q) = 3 + q$ we found the monopoly price and quantity in the lecture notes. Suppose instead that the market inverse demand was

$$\begin{aligned}p &= D^{-1}(q) \\ &= 61 - q\end{aligned}$$

and the market monopolist's marginal cost was $MC(q) = 19 + q$. What would the monopoly quantity and price be in this market?

8. (3 point) For the duopoly market with

$$\begin{aligned}p &= D^{-1}(q) \\ &= 45 - q\end{aligned}$$

and $MC_i(q_i) = 3 + 2q_i$ we found the monopoly price and quantity in the lecture notes. Suppose instead that the market inverse demand was

$$\begin{aligned}p &= D^{-1}(q) \\ &= 61 - q\end{aligned}$$

and the marginal cost of each firm is $MC_i(q_i) = 19 + 2 * q_i$. What would the duopoly quantity and price be in this market?