Selected Solution Hints

Problem Set 6

March 2023

Questions 25 - 29

1. Supply curve of the competitive fringe:
   Each firm of the competitive fringe produces the quantity where the price equals marginal costs ($MC(q)$) which is the condition of the competitive market equilibrium. Therefore, one needs to set $p = MC(q)$.

   (a) Derive the marginal costs function from the total costs function by taking the first derivative of the total cost function with respect to the quantity. $MC(q) = \frac{\delta TC(q)}{\delta q}$ and set it equal to the price: $p = MC(q)$

   (b) Solve for q_i (quantity of a single fringe firm). This gives you the supply curve of each firm of the competitive fringe.

   (c) Aggregate the whole supply curve of the competitive fringe by multiplying each firms supply with the number of firms: $Q_{fringe} = N * q_i$. This gives you the supply curve of the whole competitive fringe.

2. Demand curve for the dominant firm:
   The demand curve which the dominant firm considers is the residual demand on the market given the supply of the competitive fringe.

   (a) Subtract the supply of the competitive fringe from the whole market demand: $Q_{dominant}(p) = Q_{demandmarket}(p) - Q_{fringe}(p)$

3. Profit of the dominant firm:
   The dominant firm behaves as a monopolist. Thus it chooses to supply a quantity that maximizes its profits. We know from microeconomics that this quantity is obtained by setting marginal costs equal to marginal revenues: $MC(q) = MR(q)$.

   (a) Calculate the marginal revenue function of the dominant firm by taking the first derivative of the total revenue function with respect to q. The total revenue function of the dominant firm equals: $TR_{dominant}(q) = Q_{dominant} * p$ and thus the marginal revenue function is: $MR(q) = \frac{\delta TR_{dominant}(q)}{\delta q}$.

   (b) Calculate its marginal costs: $MC(q) = \frac{\delta TC(q)}{\delta q}$.

   (c) Set $MC(q) = MR(q)$

   (d) Solve for the equilibrium price p^* and quantity $q^*_{dominant}$ and calculate the monopoly profit which equals total revenues minus total costs: $\pi_{dominant} = TR(q^*_{dominant}, p^*) - TC(q^*_{dominant})$

4. Calculate the quantity supplied by the fringe:
   Plug the equilibrium price p^* obtained above into the supply function of the competitive fringe: $Q_{fringe}(p^*)$.

5. Calculate the profit of each fringe:
   Divide the total quantity supplied by the fringe through the number of firms of the fringe to obtain the quantity supplied by each fringe q_i^* and calculate each fringes profit: $\pi(q_i^*) = TR(q_i^*, p^*) - TC(q_i^*)$.

Questions 30 - 32

1. Profit maximization:
   The monopolist chooses the quantity such that the marginal returns equal the marginal costs: $MC(q) = MR(q)$.
   (a) Calculate the marginal costs: $MC(q) = \frac{\delta TC(q)}{\delta q}$.
   (b) Calculate the marginal revenue: $MR(q) = \frac{\delta TR(q)}{\delta q}$ with $TR(q) = q * P(q)$.
   (c) Set $MC(q) = MR(q)$ and solve for q^* and $P^*(q^*)$.
   (d) Calculate the profit: $\pi(q^*) = TR(q^*) - TC(q^*)$.

2. Marginal cost pricing:
   The monopolist chooses the quantity such that the price equals the marginal costs: $MC(q) = p$.
   (a) Calculate the marginal costs: $MC(q) = \frac{\delta TC(q)}{\delta q}$.
   (b) Set $MC(q) = p$ and solve for q^* and $P^*(q^*)$.
   (c) Calculate the profit: $\pi(q^*) = TR(q^*) - TC(q^*)$.

3. Average cost pricing:
   The monopolist chooses the quantity such that the price equals the average costs: $AC(q) = P(q)$.
   (a) Calculate the average costs: $AC(q) = \frac{TC(q)}{q}$.
   (b) Set $AC(q) = P(q)$ and solve for q^* and $P^*(q^*)$.
   (c) Calculate the profit: $\pi(q^*) = TR(q^*) - TC(q^*)$.