Exercise on Market Structure

1. Assume a perfectly competitive market where the price is $P = 80$. The firm has a total cost of $TC = 2 + 20q^2$. The marginal cost is as follows: $MC = 40q$. How much will the firm produce and what will the profits be?

2. Now assume that this company can pay an amount x in research and development which generates an innovation in its product and gains monopoly power, such that it faces the following inverse demand curve: $P = 44 - 2q$. Its costs remain the same. What is the minimum value of x that this company is willing to pay to transition from a perfectly competitive market to a monopoly?

3. Assume that the company decided to innovate, however after some time other companies also innovated in the product and the market became one of monopolistic competition. Now the demand curve is given by $P = \dfrac{44}{N} - 2q$ and all the firms have the same cost structure. How much does each company produce? (the result depends on N)

4. Does an increase in N harm or benefit consumers? What about firms? Explain in detail.

Solutions

1. Set price equal to marginal cost:
$$40q = 80$$
$$q = 2$$

   The profits are:
$$B = 2 * 40 - (10 + 20 * 2^2) = 80 - 10 - 80 = -2$$

2. In monopoly, we set marginal revenue equal to marginal cost. The marginal revenue is: $5 - 4q$:
$$44 - 4q = 40q$$
$$44 = 44q$$
$$1 = q$$

   The price would be: $44 - 4 * 1 = 40$ and the profits:
$$40 * 1 - (10 + 20 * 1) - x = 10 - x$$

   Since the company was earning -10 before and now earns 10, it is willing to pay up to $x = 20$.

3. First, I obtain the marginal revenue:
$$P = \frac{44}{N} - 4q$$

   Now I set marginal cost equal to marginal revenue:
$$40q = \frac{44}{N} - 4q$$
$$44q = \frac{44}{N}$$
$$q = \frac{1}{N}$$

4. An increase in N results in a lower price and higher total quantities in the market. This benefits consumers but

   harms firms as each one individually provides fewer quantities and sells them at a lower price.