Chapter 15 Practice Problems

Elements of Microeconomics (discussion section 4)

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Question 1

Fill in the following table for a monopoly firm:

Q	P	TR	AR	MR
0	$11		---	---
1	10			
2	9			
3	8			
4	7			
5	6			

Answer:

Q	P	TR	AR	MR
0	$11	$0	---	---
1	10	10	$10	$10
2	9	18	9	8
3	8	24	8	6
4	7	28	7	4
5	6	30	6	2

Question 2

Assume that we have a monopoly firm in the market for internet. The market demand, average total cost, marginal cost for the firm, and marginal revenue for the firm is:

$$Q_D = 40 - 2P$$

$$ATC = \frac{50}{Q} + \frac{1}{4}Q$$

$$MC = \frac{1}{2}Q$$

$$MR = 20 - Q$$

(a) Graph these curves.

(b) Find the profit maximizing quantity for the firm (Q^M) and label it on your graph.

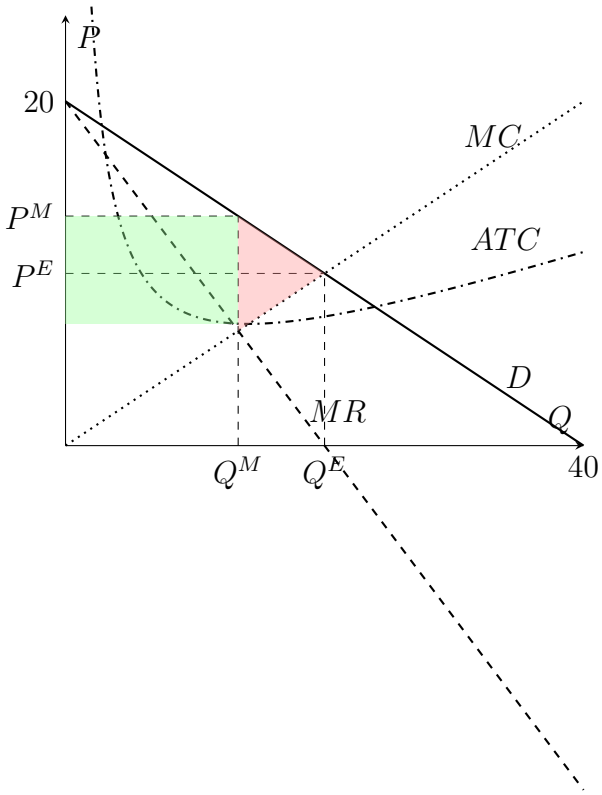
(c) What is the socially optimal quantity (Q^E)? Label it on your graph

(d) Calculate the profit for the firm and label it on your graph.

(e) Calculate the deadweight loss in this market and label it on your graph.

Answer:

(a) Graph (green = π, red = DWL):



(b) The firm maximizes profit where $MR = MC$:

$$\begin{aligned} MR &= MC \\ 20 - Q &= \frac{1}{2}Q \\ 20 &= \frac{3}{2}Q \\ \frac{40}{3} &= Q^M \end{aligned}$$

(c) The socially optimal quantity is the Q where $MC = D$: First solve the demand curve for P:

$$\begin{aligned} Q_D &= 40 - 2P \\ 2P &= 40 - Q_D \\ P &= 20 - \frac{1}{2}Q_D \end{aligned}$$

Then set the demand curve equal to marginal cost:

$$\begin{aligned} 20 - \frac{1}{2}Q &= \frac{1}{2}Q \\ 20 &= Q^E \end{aligned}$$

(d) The profit for a monopoly firm is the difference between the price they charge and their average total cost (at that Q^M) multiplied by the quantity sold. We know that the monopoly firms profit maximizing quantity is $Q^M = \frac{40}{3}$. So we can calculate the average total cost of the firm by plugging that value of Q^M into the ATC function:

$$\begin{aligned} ATC(Q^M) &= \frac{50}{Q} + \frac{1}{4}Q \\ ATC(Q^M) &= 50 * \frac{3}{40} + \frac{40}{3} * \frac{1}{4} \\ ATC(Q^M) &= \frac{15}{4} + \frac{40}{12} \\ ATC(Q^M) &= \frac{85}{12} \end{aligned}$$

And we can calculate the monopoly firms price by plugging Q^M into the demand equation:

$$\begin{aligned} Q_D &= 40 - 2P \\ \frac{40}{3} &= 40 - 2P \\ 2P &= \frac{120}{3} - \frac{40}{3} \\ 2P &= \frac{80}{3} \\ P^* &= \frac{80}{6} = \frac{40}{3} \end{aligned}$$

Then the profit of the monopoly firm will be:

$$\begin{aligned}
\pi &= (P^* - ATC) * Q^M \\
\pi &= (\frac{40}{3} - \frac{85}{12}) * \frac{40}{3} \\
\pi &= (\frac{160 - 85}{12}) * \frac{40}{3} \\
\pi &= \frac{75}{12} * \frac{40}{3} \\
\pi &= \frac{3000}{36} = \frac{250}{3}
\end{aligned}$$

(e) The deadweight loss in this market will be the firms price minus their marginal cost multiplied by the difference between the socially optimal quantity and the firms profit maximizing quantity, all times one half:

$$\begin{aligned}
DWL &= \frac{1}{2}(P^* - MC) \times (Q^E - Q^M) \\
&= \frac{1}{2} * (\frac{40}{3} - \frac{40}{6}) * (20 - \frac{40}{3}) \\
&= \frac{1}{2} * \frac{20}{3} * \frac{20}{3} \\
DWL &= \frac{1}{2} * \frac{400}{9} = \frac{400}{18} = \frac{200}{9}
\end{aligned}$$

Question 3

Give a real world example of price discrimination, and explain how it increases social welfare.
Answer:

1. Movie theaters often charge lower ticket prices for students and seniors. Because these groups have more elastic demand, discounted prices allow the firm to serve consumers who would not purchase at the regular price, increasing total surplus and improving allocative efficiency.

2. Airlines use price discrimination by charging business travelers higher fares than leisure travelers. By separating consumers by willingness to pay, airlines fill more seats that would otherwise go empty, increasing total surplus and reducing deadweight loss.

3. Pharmaceutical companies sell the same drug at lower prices in low-income countries and higher prices in high-income countries. This expands access for price-sensitive consumers while still covering fixed R&D costs, raising overall social welfare.