Homework #3_ Sol

Chp 13

1. 13.3

3. a. The following table shows the marginal product of each hour spent fishing:

Hours	Fish	Fixed Cost	Variable Cost	Total Cost	Marginal Product
0	0	$10	$0	$10	---
1	10	10	5	15	10
2	18	10	10	20	8
3	24	10	15	25	6
4	28	10	20	30	4
5	30	10	25	35	2

b. Figure 7 graphs the fisherman's production function. The production function becomes flatter as the number of hours spent fishing increases, illustrating diminishing marginal product.

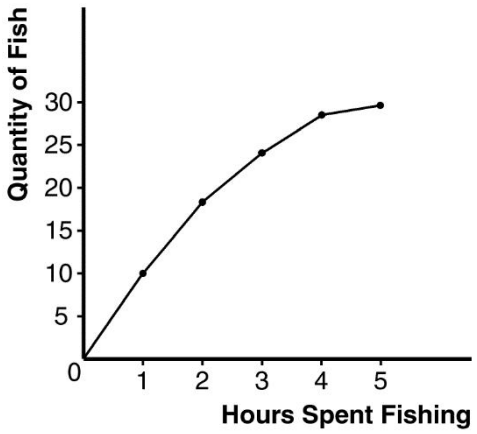


Figure 7

c. The table shows the fixed cost, variable cost, and total cost of fishing. Figure 8 shows the fisherman's total-cost curve. It has an upward slope because catching additional fish takes additional time. The curve is convex because there are diminishing returns to fishing time because each additional hour spent fishing yields fewer additional fish.

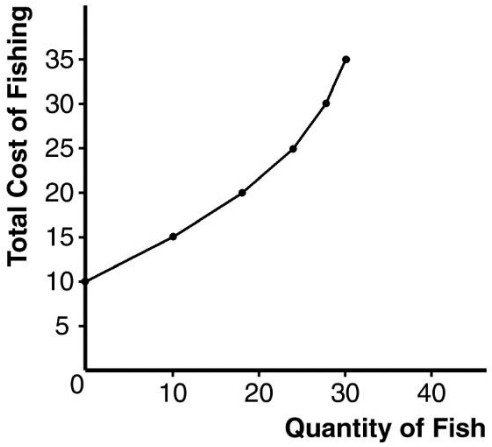


Figure 8

2. 13.5

5. At an output level of 600 players, total cost is $180,000 (600 × $300). The total cost of producing 601 players is $180,901. Therefore, you should not accept the offer of $550, because the marginal cost of the 601st player is $901.

3. 13.8

8. a. The lump-sum tax causes an increase in fixed cost. Therefore, as Figure 10 shows, only average fixed cost and average total cost will be affected.

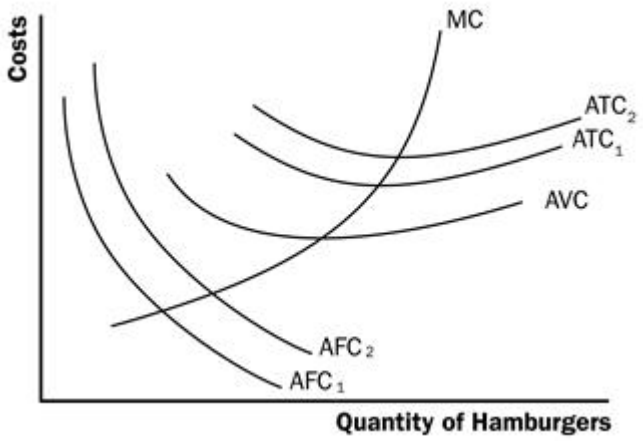


Figure 10

b. Refer to Figure 11. Average variable cost, average total cost, and marginal cost will all be greater. Average fixed cost will be unaffected.

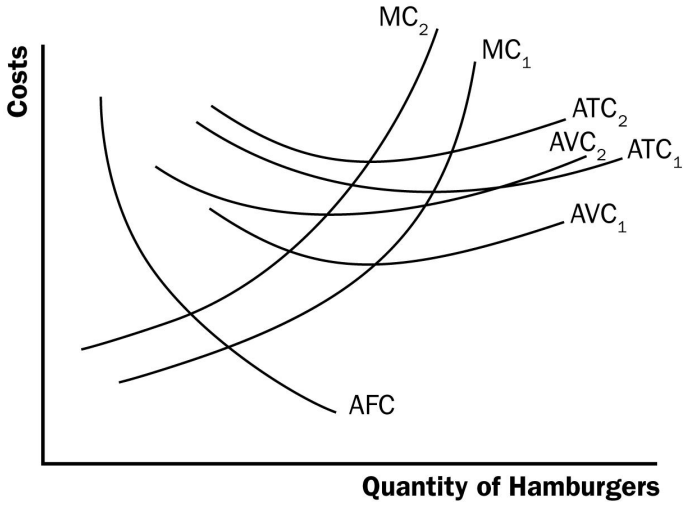


Figure 11

4. 13.10

10. The following table shows quantity (*Q*), total cost (*TC*), and average total cost (*ATC*) for the three firms:

	Firm A		Firm B		Firm C	
Quantity	***TC***	***ATC***	***TC***	***ATC***	***TC***	***ATC***
1	$60.00	$60.00	$11.00	$11.00	$21.00	$21.00
2	70.00	35.00	24.00	12.00	34.00	17.00
3	80.00	26.67	39.00	13.00	49.00	16.33
4	90.00	22.50	56.00	14.00	66.00	16.50
5	100.00	20.00	75.00	15.00	85.00	17.00
6	110.00	18.33	96.00	16.00	106.00	17.67
7	120.00	17.14	119.00	17.00	129.00	18.43

Firm A has economies of scale because average total cost declines as output increases. Firm B has diseconomies of scale because average total cost rises as output rises. Firm C has economies of scale from one to three units of output and diseconomies of scale for levels of output beyond three units.

Chp 14

5. 14.1

1. a. As shown in Figure 3, the typical firm's initial marginal-cost curve is MC_1

and its average-total-cost curve is ATC_1. In the initial equilibrium, the market supply curve, S_1, intersects the demand curve at price P_1, which is equal to the minimum average total cost of the typical firm. Thus, the typical firm earns no economic profit. The rise in the price of crude oil increases production costs for individual firms (from MC_1 to MC_2 and from ATC_1 to ATC_2) and thus shifts the market supply curve to the left, to S_2.

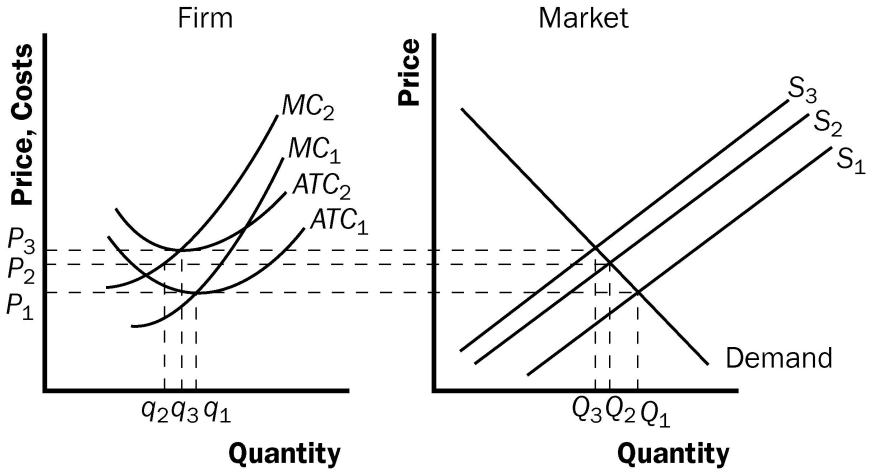


Figure 3

b. When the market supply curve shifts left to S_2, the equilibrium price rises from P_1 to P_2, but the price does not increase by as much as the increase in marginal cost for the firm. As a result, price is less than average total cost for the firm, so profits are negative.

In the long run, the negative profits lead some firms to exit the market. As they do so, the market supply curve shifts to the left. This continues until the price rises to equal the minimum point on the firm's average-total-cost curve. The long-run equilibrium occurs with supply curve S_3, equilibrium price P_3, total market output Q_3, and firm's output q_3. Thus, in the long run, profits are zero again and there are fewer firms in the market.

6. 14.5

5. a. Figure 5 shows the curves of a typical firm in the industry, with average total cost ATC_1, marginal cost MC_1, and marginal revenue equal to price P_1. The long-run-supply curve is the marginal cost curve above the minimum point of ATC_1.

b. The new process reduces Hi-Tech's marginal cost to MC_2 and its average total cost to ATC_2, but the price remains at P_1 because other firms cannot

use the new process. Thus Hi-Tech produces Q_2 units and earns positive profits.

c. When the patent expires and other firms are free to use the technology, all firms' average-total-cost curves decline to ATC_2, so the market price falls to P_3 and firms earn zero profit.

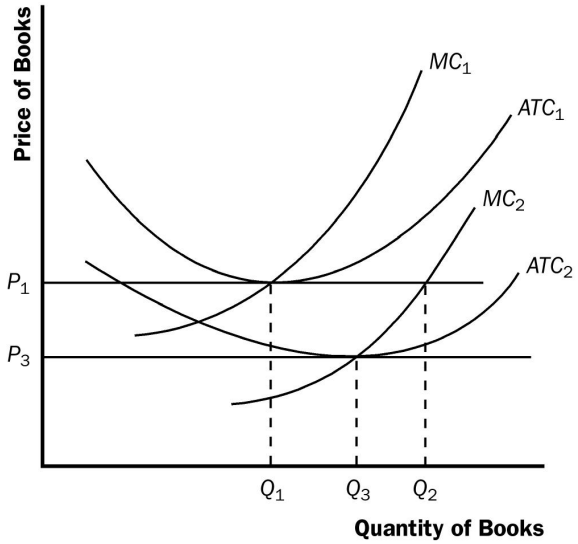


Figure 5

7. 14.11

11. a. Each firm's fixed cost, the portion of total cost that does not vary with changes in q, is \$50. Each firm's variable cost, the portion of total cost that varies with changes in q, is $\frac{1}{2}q^2$. The equation for average total cost is: $ATC = \frac{TC}{q} = \frac{50}{q} + \frac{1}{2}q$.

b. See Figure 8 for the graph of the average-total-cost curve and the marginal-cost curve for q from 5 to 15. The average-total-cost curve is minimized when the quantity is 10. The average total cost and marginal cost are both \$10 at that quantity.

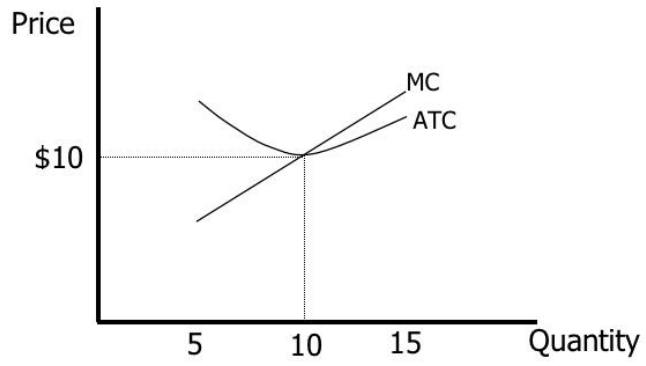


Figure 8

c. The supply curve for each firm is the segment of the marginal-cost curve that lies above the intersection of the average-total-cost curve and the marginal-cost curve, so the supply curve for each firm is: $q = \begin{cases} 0 \text{ when } P < \$10 \\ P \text{ when } P \geq \$10 \end{cases}$

d. In the short run, the supply curve for each firm is the segment of the marginal-cost curve that lies above the intersection of the average-variable-cost curve ($AVC = \frac{1}{2}q$) and the marginal-cost curve.

The average-variable-cost curve and the marginal-cost curve intersect where q=0, so the short-run supply curve for each firm is $q^S = P$. Because the number of firms is fixed at 9 in the short run, the short-run market supply curve is $Q^S = 9q^S = 9P$.

e. Setting the market demand and market supply curves equal to each other, $120 - P = 9P$, adding P to both sides of the equation, $120 = 10P$, and solving for P, the equilibrium price is $12. Substituting the price into either the demand function or the supply function yields the equilibrium quantity, 108.

f. In this equilibrium, each of the 9 firms produces (108/9 = 12) 12 units. Profit is total revenue minus total cost. Total revenue is $TR = P \times Q = \$12 \times 12 = \$144$ and total cost is $TC = 50 + \frac{1}{2}q^2 = 50 + \frac{1}{2}(12)^2 = \$122$, so each firm's profit is $144 - $122 = $22. Because the profit is greater than zero, there is an incentive for firms to enter the market.

g. In the long run with free entry and exit, all firms will earn zero economic profit so the price will be equal to the minimum of the average-total-cost curve. The equilibrium price will be $10. When the price is $10, the equilibrium quantity is 110 units.

h. In this long run equilibrium, $q = P = 10$, so each firm produces 10 units and there are 110/10 = 11 firms.

8.

（1）如果垃圾邮件接收者从邮件中得到了对自己有用的商品信息，他就会回应这一封邮件，并可能最终购买该邮件所宣传的商品。而对于那些毫不关心垃圾邮件的接收者来说，垃圾邮件增加了他们的阅读负担，加剧了邮件服务器的负荷。问：作为商业广告，垃圾邮件给发送者带来的边际收益是什么，给接收者中的回应者带来的边际收益是什么？它给发送者带来的边际成本是什么，给那些不关心邮件的接收者带来的边际成本是什么？

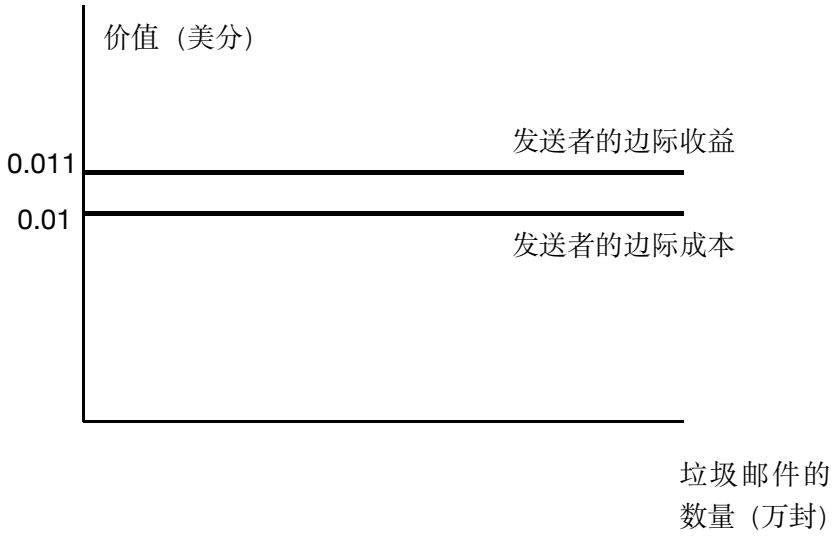
答：垃圾邮件给发送者带来的边际收益是每个接收者可能购买其宣传产品的预期利润；给接收者中回应者带来的边际收益是获得了对自己有用的商品信息。给发送者带来的边际成本是每发送一封邮件花费的时间（非常微小）；给那些不关心邮件的接受者带来的边际成本是个人阅读负担与服务器负荷的增加。

（2）软件工程师估计，每封垃圾邮件的发送成本低至 0.01 美分，而回应者的比例低至十万分之一。给定这一条件，你认为垃圾邮件导致了怎样的外部性？程度如何？这样的外部性导致垃圾邮件相对于社会合意的水平是太多了还是太少了？解释之。

答：这些数据表明发送者的私人成本很小；而社会成本很大（因为绝大部分的接收者都属于受损者）。这足以导致垃圾邮件具有很强的负外部性。因此导致垃圾邮件过多。

（3）假定垃圾邮件的发送者从每个回应者身上能够赚取 11 美元的收益。根据这些数据，画出对于垃圾邮件发送者而言的边际收益曲线和边际成本曲线。边际收益和成本曲线具有怎样的形状？（提示：假定垃圾邮件的潜在接收者的数量非常之大；同时，注意到垃圾邮件发送者并不清楚接收者中哪些会做出回应——垃圾邮件的目标指向性极差。）

答：边际收益曲线和边际成本曲线都是近乎水平，高度各为 0.011 美分和 0.01 美分。图形如下：



（4）垃圾邮件发送者从每个接收者身上赚得的平均利润大致是多少？根据你的边际收益与成本曲线的形状，你估计发送者发送的垃圾邮件的数量是大还是小？总的来说，垃圾邮件发送者从所有的接收者身上得到的总利润有没有可能是很大的？

答：平均利润（同时边际利润）大致为 0.001 美分，非常小；但由于边际收益和成本曲线是接近水平的，最优（利润最大）的发送数量是非常大（接近于无穷）。总利润有可能是很大的。

软件工程师们设计了两种反垃圾邮件的方法。第一种是智能软件过滤器，通过分析邮件内容的某些特征（例如，使用某些商业性词语的频率等）来识别出垃圾邮件并加以屏蔽。第二种是发送者身份的认证系统。其中一种要求发送者在发送邮件时附上一张小额电子支票，例如 1 美分。如果该邮件没有问题，接收者不会要求兑现支票。如果该邮件被接收者认为是垃圾邮件，则通过一套标准化的投诉机制，接收者可以获得支票的兑现。

（5） 在第一种方案下，垃圾邮件的发送者可以通过对垃圾邮件的内容进行加工，以规避智能软件的跟踪。例如，加入乱码或天气预报等随机内容，或改变单词的拼写（如用数字“0”代替字母“O”）等。当然，破解越高级的智能软件需要邮件发送者付出更大的成本（如雇佣更高水平的计算机专家）。问：这种反垃圾邮件的方法如何改变了垃圾邮件发送者的成本？给定垃圾邮件发送者继续发送垃圾邮件，这种方法是否影响其发送的数量？

答：这改变了发送者的固定成本但没有改变其边际成本。因而不影响其发送的数量。

（6）与第一种方案相比，第二种方案如何影响发送者的边际收益和成本曲线？它是否影响发送者发送垃圾邮件的数量？影响是大还是小？

答：这种方案提高了发送者的边际成本，没有改变边际收益。由于发送者的边际收益和成本曲线都接近于水平（弹性非常之大），因此即使非常小的边际成本增加都会极大地减少发送者发送垃圾邮件的数量。

（7）你认为哪一种方案可能会更加有效？解释之。

答：第二种。因为垃圾邮件的总利润可能很大，这使得第一种方案增加的固定成本必须足够大才能阻止发送者发送任何的垃圾邮件，否则会毫无效果。而第二种方案针对了垃圾邮件极低的边际利润的弱点，改变了发送者的边际决策，很小的惩罚就可以消除垃圾邮件。

Chp 15

1.

4. a. The table below shows total revenue and marginal revenue for the bridge. The profit-maximizing price will occur at the quantity at which marginal revenue equals marginal cost. In this case, marginal cost equals zero, so the profit-maximizing quantity occurs where marginal revenue equals 0. This occurs at a price of $4 and quantity of 400,000 crossings. The efficient level of output is 800,000 crossings, because that is where price is equal to marginal cost. The profit-maximizing quantity is lower than the efficient quantity because the firm is a monopolist.

Price	Quantity (in Thousands)	Total Revenue (in Thousands)	Marginal Revenue
$8	0	$0	----
7	100	700	$7

6	200	1,200	5
5	300	1,500	3
4	400	1,600	1
3	500	1,500	-1
2	600	1,200	-3
1	700	700	-5
0	800	0	-7

b. The company should not build the bridge because its profits are negative. The most revenue it can earn is $1,600,000 and the cost is $2,000,000, so it would lose $400,000.

c. If the government were to build the bridge, it should set price equal to marginal cost to be efficient. Since marginal cost is zero, the government should not charge people to use the bridge.

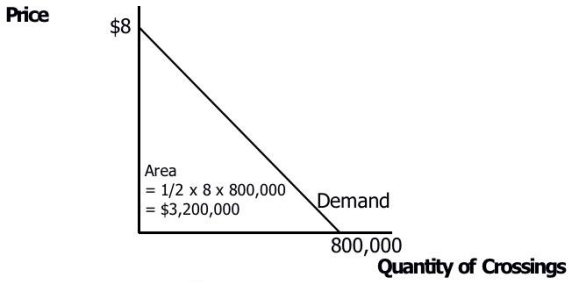


Figure 5

d. Yes, the government should build the bridge, because it would increase society's total surplus. As shown in Figure 5, total surplus has area ½ × 8 × 800,000 = $3,200,000, which exceeds the cost of building the bridge.

2.

6. a. The profit-maximizing outcome is the same as maximizing total revenue in this case because there are no variable costs. The total revenue from selling to each type of consumer is shown in the following tables:

Price	Quantity of Adult Tickets	Total Revenue from Sale of Adult Tickets
10	0	0
9	100	900
8	200	1,600
7	300	2,100
6	300	1,800
5	300	1,500
4	300	1,200
3	300	900

2	300	600
1	300	300
0	300	0

Price	Quantity of Child Tickets	Total Revenue from Sale of Child Tickets
10	0	0
9	0	0
8	0	0
7	0	0
6	0	0
5	100	500
4	200	800
3	200	600
2	200	400
1	200	200
0	200	0

To maximize profit, you should charge adults $7 and sell 300 tickets. You should charge children $4 and sell 200 tickets. Total revenue will be $2,100 + $800 = $2,900. Because total cost is $2,000, profit will be $900.

b. If price discrimination were not allowed, you would want to set a price of $7 for the tickets. You would sell 300 tickets and profit would be $100.

c. The children who were willing to pay $4 but will not see the show now that the price is $7 will be worse off. The producer is worse off because profit is lower. Total surplus is lower. There is no one that is better off.

d. In (a) total profit would be $400. In (b), there would be a $400 loss. There would be no change in (c).

3.

7. a. The museum's average-total-cost curve and marginal-cost curve are shown in Figure 7 below. Because all of the cost is fixed, the average-total-cost curve is downward-sloping like an average-fixed-cost curve and the marginal cost is zero. The museum is a natural monopoly.

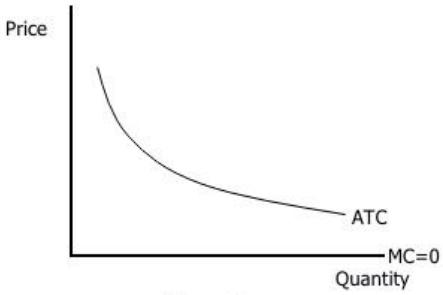


Figure 7

b. With a lump sum tax of $24, the price of admission is $0 so each person would visit the museum ($Q^D = 10 - 0$) 10 times. The benefit each person would get from the museum would be consumer surplus of $(\frac{1}{2} \times 10 \times 10)$ $50 less the $24 tax, or $26.

c. If the museum finances itself by charging an admission fee, the lowest price the museum can charge without incurring a loss is $4, as shown in the following table.

Price	Number of Visits per Person	Museum Profit $\pi = (P \times Q) - TC$
$2	8	($2 x 800,000) – $2,400,000 = -$800,000
$3	7	($3 x 700,000) - $2,400,000 = -$300,000
$4	6	($4 x 600,000) - $2,400,000 = $0
$5	5	($5 x 500,000) - $2,400,000 = $100,000

d. When the price is $4 and each person visits the museum 6 times, each person's consumer surplus is $(\frac{1}{2} \times (10 - 4) \times 6)$ $18, which is $8 less than each person's benefit under the tax plan. Because each person has the same demand curve, all are better off under the mayor's plan.

e. The real world considerations that might favor an admission fee include the administrative cost to collect the lump sum tax from all 100,000 residents compared to the relatively simple collection of an admission fee and the unpopular nature of taxes.

4.

8 a. Figure 8 below illustrates the demand, marginal revenue, and marginal cost curves.

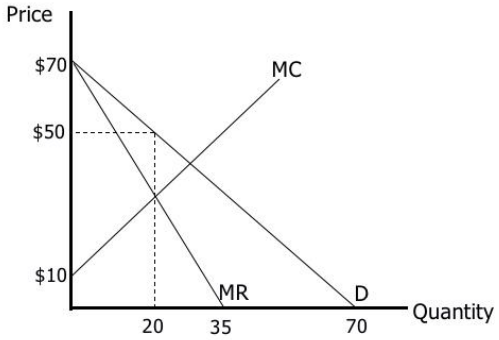


Figure 8

Assuming Mr. Potter profit-maximizes, he sets MR=MC and solves for the profit maximizing quantity. Then he substitutes the profit-maximizing quantity into the demand curve:

$70 - 2Q = 10 + Q$
$60 = 3Q$
$Q = 20$
$P = 70 - Q = \$50$

b. If the mayor sets a price ceiling 10% lower than the profit-maximizing price, the price would be $45 and the quantity demanded would be $(\$45 = 70 - Q)$ 25 units of water. The marginal cost of producing 25 units of water is (10 +25) $35. While Mr. Potter would prefer to sell 20 units at a price of $50 per unit, he is willing to sell 25 units at the ceiling price of $45 because the price still exceeds his marginal cost of production.

c. Uncle Billy is incorrect. Price ceilings cause shortages when the ceiling price is lower than the competitive price, at which price equals marginal cost. Because the ceiling still exceeds the competitive price and marginal cost, there is no shortage in this case.

d. If the ceiling is set 50% below the profit-maximizing price, at $25, the quantity demanded would be $(\$25 = 70 - Q)$ 45 units of water and Mr. Potter would produce $(\$25 = 10 + Q)$ 15 units of water, where the price equals his marginal cost. In this case, Uncle Billy is correct. The price ceiling creates a shortage of 30 units of water.

5.

9. a. The monopolist would set marginal revenue equal to marginal cost and then substitute the profit-maximizing quantity into the demand curve to find the price:

$10 - 2Q = 1 + Q$

$9 = 3Q$

$Q = 3$

$P = 10 - Q = \$7$

Total revenue = $P \times Q = (\$7)(3) = \$21$

Total cost = $3 + 3 + 0.5(9) = \$10.5$

Profit = $\$21 - \$10.5 = \$10.5$

b. The firm becomes a price taker at a price of \$6 and no longer has monopoly power. In a competitive equilibrium, the price equals marginal cost so,

$10 - Q = 1 + Q$

$10 = 1 + 2Q$

$9 = 2Q$

$Q = 4.5$

P = 5.5

The firm will export soccer balls because the world price is greater than the domestic price (in the absence of monopoly power). As Figure 9 shows, domestic production will rise to 5 soccer balls, domestic consumption will rise to 4, and exports will be 1.

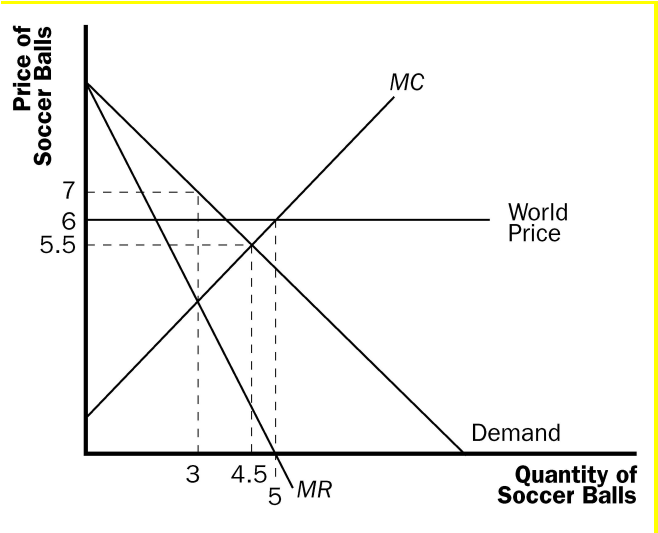


Figure 9

c. The price actually falls even though Wiknam will now export soccer balls. Once trade begins, the firm no longer has monopoly power and must become a price taker. However, the world price of \$6 is greater than the

competitive equilibrium price ($5.50) so the country exports soccer balls.

d. Yes. The country would still export balls at a world price of $7. The firm is a price taker and no longer is facing a downward-sloping demand curve. Thus, it is now possible to sell more without reducing price.

6.

10. a. Figure 10 shows the firm's demand, marginal revenue, and marginal cost curves. The firm's profit is maximized at the output where marginal revenue is equal to marginal cost. Therefore, setting the two equations equal, we get:

$1{,}000 - 20Q = 100 + 10Q$
$900 = 30Q$
$Q = 30$

The monopoly price is $P = 1{,}000 - 10Q = 700$ Ectenian dollars.

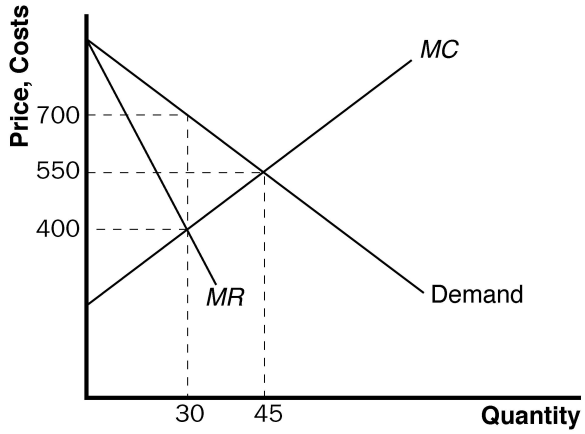


Figure 10

b. Social welfare is maximized where price is equal to marginal cost:

$1{,}000 - 10Q = 100 + 10Q$
$900 = 20Q$
$Q = 45$

At an output level of 45, the price would be 550 Ectenian dollars.

c. The deadweight loss would be equal to (0.5)(15)(300) = 2,250 Ectenian dollars.

d. i. A flat fee of 2000 Ectenian dollars would not alter the profit-maximizing price or quantity. The deadweight loss would be unaffected.

ii. A fee of 50 percent of the profits would not alter the profit-maximizing price or quantity. The deadweight loss would be unaffected.

iii. The marginal cost of production would rise by 150 Ectenian dollars if the director was paid that amount for every unit sold. The new marginal cost would be $100 + 10Q + 150$. The new profit-maximizing output would be 25, the marginal cost at that level would be 500, and the price would rise to 750. The deadweight loss would be smaller. With the new marginal cost function, the quantity at which social welfare is maximized changes. Now, price is equal to marginal cost when $Q = 37.5$:

$1{,}000 - 10Q = 250 + 10Q$
$750 = 20Q$
$Q = 37.5$

As a result, the deadweight loss would be equal to $(0.5)(37.5-25)(750-500) = 1{,}562.50$ Ectenian dollars rather than 2,250 Ectenian dollars.

iv. If the director is paid 50 percent of the revenue, then total revenue is $500Q - 5Q^2$. Marginal revenue becomes $500 - 10Q$. The profit-maximizing output level will be 20 and the price will be 800 Ectenian dollars. The deadweight loss will be greater.

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7. a. As N rises, the demand for each firm's product falls. As a result, each firm's demand curve will shift left.

b. The firm will produce where $MR = MC$:

$100/N - 2Q = 2Q$
$Q = 25/N$

c. $25/N = 100/N - P$

$P = 75/N$

d. Total revenue = $P \times Q = 75/N \times 25/N = 1875/N^2$

Total cost = $50 + Q^2 = 50 + (25/N)^2 = 50 + 625/N^2$

Profit = $1875/N^2 - 625/N^2 - 50 = 1250/N^2 - 50$

e. In the long run, profit will be zero. Thus:

$1250/N^2 - 50 = 0$

$1250/N^2 = 50$

$N = 5$

10. a. Figure 6 shows Sleek's demand, marginal-revenue, marginal-cost, and average-total-cost curves. The firm will maximize profit at an output level of Q^* and a price of P^*. The shaded are shows the firm's profits.

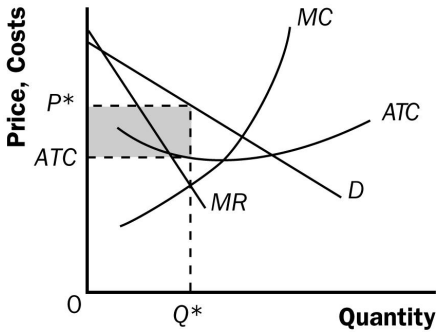

Figure 6

b. In the long run, firms will enter, shifting the demand for Sleek's product to the left. Its price and output will fall. Firms will enter until profits are equal to zero (as shown in Figure 7).

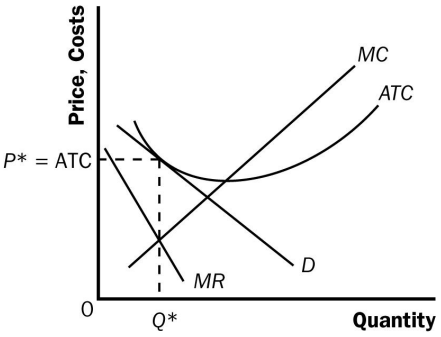

Figure 7

c. As consumers become more focused on the stylistic differences in brands, they will be less focused on price. This will make the demand for each firm's products more price inelastic. The demand curves may become relatively steeper, allowing Sleek to charge a higher price. If these stylistic features cannot be copied, they may serve as a barrier to entry and allow Sleek to earn profit in the long run.

d. A firm in monopolistic competition produces where marginal revenue is greater than zero. This means that firm must be operating on the elastic portion of its demand curve.