**EE211 Section 1 Homework 5 Answers**

1. Profit Maximization for a Monopoly
    a. Draw the demand, marginal revenue, average-total-cost, and marginal cost curves for a monopolist. Show the profit maximizing output, the profit-maximizing price, and the amount of profit. (Check your answers on Chapter 16 eBook)
    b. In your diagram from the previous question, show the output that maximizes total surplus. Show the deadweight loss from the monopoly. Explain your answer. (Check your answers on Chapter 16 eBook)

2. Why is a monopolist's marginal revenue less than the price of its good? (Check your answers on Chapter 16 eBook)
3. Give an example of a negative externality and an example of a positive externality. (Check your answers on Chapter 10-11 eBook)
4. What are the corrective taxes? Why do economists prefer them to regulations as a way of protecting the environment from pollution? (Check your answers on Chapter 10-11 eBook)

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**Chapter 16**
Problems and Applications # 1, 3, 4 and 5

**Chapter 19**
Problems and Applications # 1, 2, and 3

**Chapter 10**
Problems and Applications # 3

**Chapter 16**
Problems and Applications # 1, 3, 4 and 5

1. The following table shows revenue, costs, and profits:

| Price | Quantity | Total Revenue | Marginal Revenue | Total Cost | Profit |
|---|---|---|---|---|---|
| $100 | 0 | $0 | ---- | $2,000,000 | $-2,000,000 |
| 90 | 100,000 | 9,000,000 | $90 | 3,000,000 | 6,000,000 |
| 80 | 200,000 | 16,000,000 | 70 | 4,000,000 | 12,000,000 |
| 70 | 300,000 | 21,000,000 | 50 | 5,000,000 | 16,000,000 |
| 60 | 400,000 | 24,000,000 | 30 | 6,000,000 | 18,000,000 |
| 50 | 500,000 | 25,000,000 | 10 | 7,000,000 | 18,000,000 |
| 40 | 600,000 | 24,000,000 | -10 | 8,000,000 | 16,000,000 |
| 30 | 700,000 | 21,000,000 | -30 | 9,000,000 | 12,000,000 |
| 20 | 800,000 | 16,000,000 | -50 | 10,000,000 | 6,000,000 |
| 10 | 900,000 | 9,000,000 | -70 | 11,000,000 | -2,000,000 |
| 0 | 1,000,000 | 0 | -90 | 12,000,000 | -12,000,000 |

a. A family profit-maximizing publisher would choose a quantity of 400,000 at a price of $60 or a quantity of 500,000 at a price of $50; both combinations would lead to profits of $18 million.

b. Marginal revenue is less than price. Price falls when quantity rises because the demand curve slopes downward, but marginal revenue falls even more than price because the firm loses revenue on all the units of the good sold when it lowers the price.

c. Figure A shows the marginal-revenue, marginal-cost, and demand curves. The marginal-revenue and marginal-cost curves cross between quantities of 400,000 and 500,000. This signifies that the firm maximizes profits in that region.

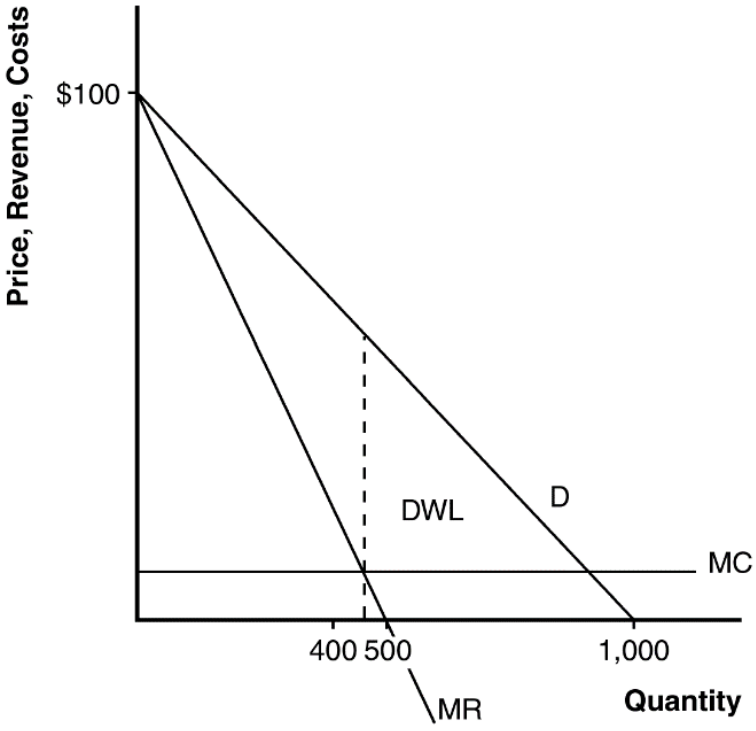


Figure A

d. **The area of deadweight loss is marked "DWL" in the figure**. Deadweight loss means that the total surplus in the economy is less than it would be if the market were competitive, because the monopolist produces less than the socially efficient level of output.

e. If the author were paid $3 million instead of $2 million, the publisher would not change the price, because there would be no change in marginal cost or marginal revenue. The only thing that would be affected would be the firm's profit, which would fall.

f. To maximize economic efficiency, the publisher would set the price at $10 per book, because that is the marginal cost of the book. At that price, the publisher would have negative profits equal to the amount paid to the author.

3.

a. The following table shows total revenue and marginal revenue for each price and quantity sold:

| Price | Quantity | Total Revenue | Marginal Revenue | Total Cost | Profit |
|---|---|---|---|---|---|
| 24 | 10,000 | $240,000 | ---- | $50,000 | $190,000 |
| 22 | 20,000 | 440,000 | $20 | 100,000 | 340,000 |
| 20 | 30,000 | 600,000 | 16 | 150,000 | 450,000 |
| 18 | 40,000 | 720,000 | 12 | 200,000 | 520,000 |
| 16 | 50,000 | 800,000 | 8 | 250,000 | 550,000 |
| 14 | 60,000 | 840,000 | 4 | 300,000 | 540,000 |

b. Profits are maximized at a quantity where MR=MC. The quantity at which MC is closest to MR without exceeding it is 50,000 albums at a price of $16. At that point, profit is $550,000.

a. As Swift's agent, you should recommend that she demand $550,000 from them, so she receives all of the profit (rather than the record company). The firm would still choose to produce 50,000 albums because their marginal cost would not change.

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.

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

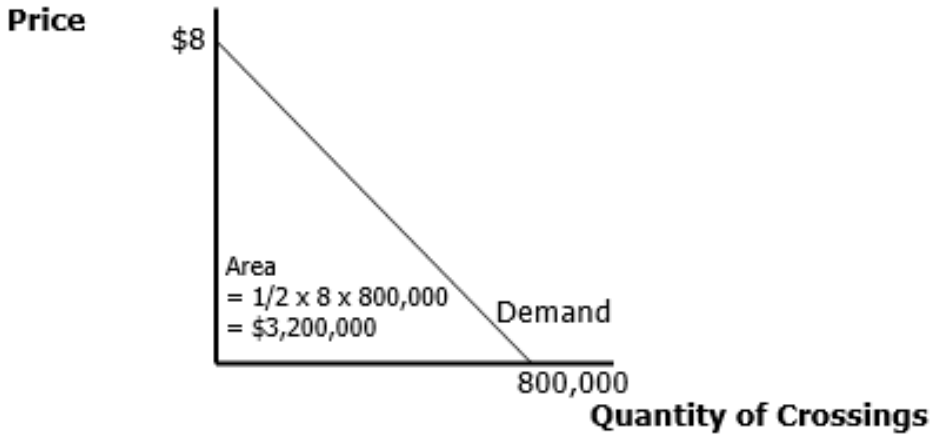

Figure B

5.

a.

A monopolist always produces a quantity at which demand is elastic. If the firm produced a quantity for which demand was inelastic and the firm raised its price, quantity would fall by a smaller percentage than the rise in price, so revenue would increase. Because costs would decrease at a lower quantity, the firm would have higher revenue and lower costs, so profit would be higher. Thus the firm should keep raising its price until profits are maximized, which must happen on an elastic portion of the demand curve.

b.

As Figure C shows, another way to see this is to note that on an inelastic portion of the demand curve, marginal revenue is negative. Increasing quantity requires a greater percentage reduction in price, so revenue declines. Because a firm maximizes profit where marginal cost equals marginal revenue, and marginal cost is never negative, the profit-maximizing quantity can never occur where marginal revenue is negative. Thus, it can never be on the inelastic portion of the demand curve. Total revenue is maximized where marginal revenue is equal to zero ($Q_{TR}$).

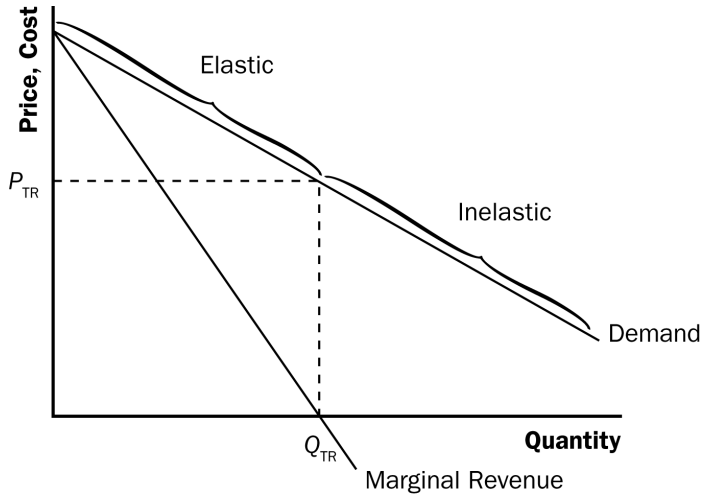

Figure C

Chapter 19
Problems and Applications # 1, 2, and 3
1.

a. The law requiring people to eat one apple a day increases the demand for apples. As shown in Figure A, demand shifts from $D_1$ to $D_2$, increasing the price from $P_1$ to $P_2$, and increasing quantity from $Q_1$ to $Q_2$.

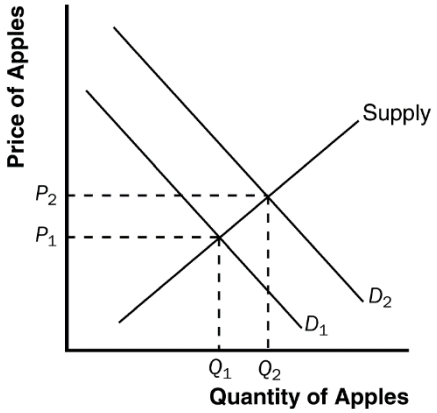


**Figure A**

b. Because the price of apples increases, the value of the marginal product increases for any given quantity of labor. There is no change in the marginal product of labor for any given quantity of labor. However, firms will choose to hire more workers and thus the marginal product of labor at the profit-maximizing level of labor will be lower.

c. As Figure B shows, the increase in the value of the marginal product of labor shifts the demand curve of labor from $D_1$ to $D_2$. The equilibrium quantity of labor rises from $L_1$ to $L_2$, and the wage rises from $w_1$ to $w_2$.

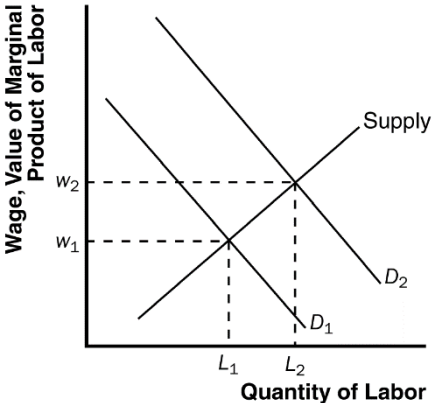


**Figure B**

2.

a. If Congress were to buy personal computers for all U.S. college students, the demand for computers would increase, raising the price of computers and thus increasing the value of the marginal product of workers who produce computers. This is shown in Figure C as a shift in the demand curve for labor from $D_1$ to $D_2$. The result is an increase in the wage from $w_1$ to $w_2$ and an increase in the quantity of labor from $L_1$ to $L_2$.

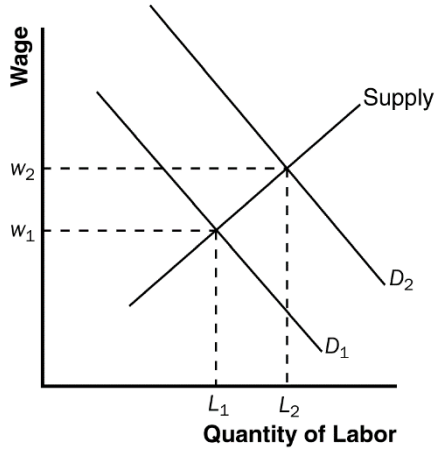


Figure C

b. If more college students major in engineering and computer science and assuming this trend does not affect the demand for computers, the supply of labor in the computer industry rises. This is shown in Figure D as a shift in the supply curve from $S_1$ to $S_2$. The result is a decrease in the wage from $w_1$ to $w_2$ and an increase in the quantity of labor from $L_1$ to $L_2$.

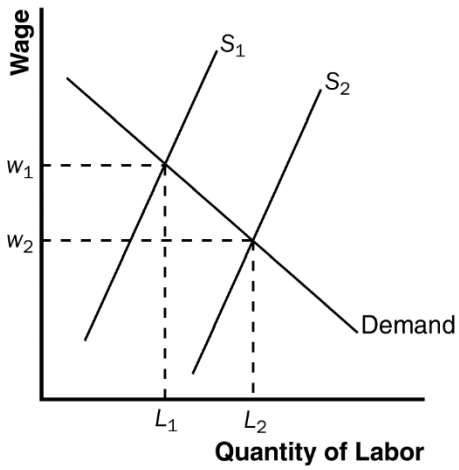


Figure D

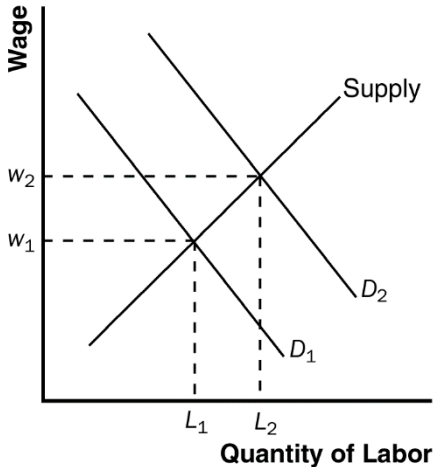


Figure E

c. If computer firms build new manufacturing plants, this increases the marginal product of labor and the value of the marginal product of labor for any given quantity of labor. This is shown in Figure E as a shift in the demand curve for labor from $D_1$ to $D_2$. The result is an increase in the wage from w1 to w2 and an increase in the quantity of labor from L1 to L2.

3.

a. The marginal product of labor is equal to the additional output produced by an additional unit of labor. The table below shows the marginal product of labor (*MPL*) for this firm:

| Days of Labor | Units of Output | *MPL* | *VMPL* |
|---|---|---|---|
| **0** | 0 | -- | -- |
| **1** | 7 | 7 | **70** |
| **2** | 13 | 6 | **60** |
| **3** | 19 | 6 | **60** |
| **4** | 25 | 6 | **60** |
| **5** | 28 | 3 | **30** |
| **6** | 29 | 1 | **10** |
| **7** | **29** | **0** | **0** |

b. The value of the marginal product of labor (*VMPL*) is equal to the price of the output ($10) multiplied by the marginal product of labor (*MPL*). It is also reported in the table.

c. The labor demand schedule for the firm is:

| Wage | Quantity of Labor Demanded |
|---|---|
| **$0** | **7** |
| **10** | **6** |
| **30** | **5** |
| **60** | **4** |
| **60** | **3** |
| **60** | **2** |
| **70** | **1** |

d. The labor demand curve is the same as the value-of-the-marginal-product curve. It is shown in Figure F.

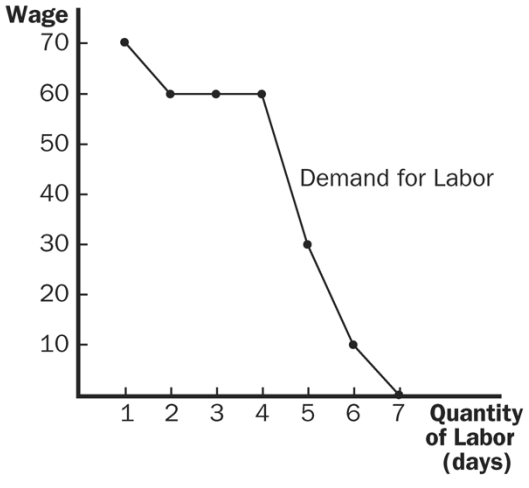


Figure F.

e. If the price of the output rises to $12, the demand for labor will shift to the right because the value of the marginal product will be higher at each level of labor hired.

Chapter 10
Problems and Applications # 3

3.

a. The market for alcohol is shown in Figure A. The social-value curve is the same as the demand curve in this case. The social-cost curve is above the supply curve because of the negative externality from increased motor vehicle accidents caused by those who drink and drive. The market equilibrium level of output is $Q_{market}$ and the efficient level of output is $Q_{optimum}$.

b. The triangular area between points A, B, and C represents the deadweight loss of the market equilibrium. This area shows the amount by which social costs exceed social value for the quantity of alcohol consumption beyond the efficient level.

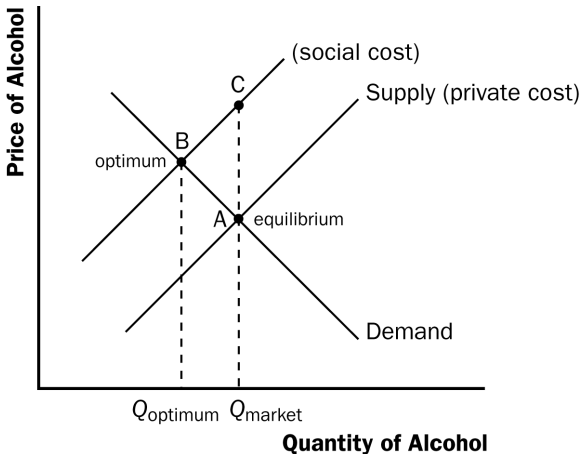


**Figure A**