1. The following information describes the demand schedule for a unique type of apple. This type of apple can only be produced by two firms because they own the land on which these unique trees spontaneously grow. As a result, the marginal cost of production is zero for these duopolists, causing total revenue to equal profit.

<table>
<thead>
<tr>
<th>Price per Bushel</th>
<th>Quantity (in bushels)</th>
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<tbody>
<tr>
<td>$12</td>
<td>0</td>
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<tr>
<td>11</td>
<td>5</td>
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<td>10</td>
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<td>9</td>
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<td>7</td>
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<td>6</td>
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<td>25</td>
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<td>4</td>
<td>20</td>
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a. If these two firms colluded and formed a cartel, what price and quantity would be generated by this market what is the level of profit generated by the market, and what is the level of profit generated by each firm? Be sure to explain your answer…

b. If one firm cheats and produces one additional increment (five units) of production, what is the level of profit generated by each firm?

c. If both firms cheat and each produces one additional increment (five units) of production, what is the level of profit generated by each firm? Will either firm choose to produce an additional increment (five more units)? Explain…

d. Using your answer from part a, b & c, which is a monopoly equilibrium and a Nash equilibrium? Explain…

Solution:

a. In order to solve, you can either calculate the total revenue (price x quantity), which happens to be the maximum profit or you can go further by calculating the marginal revenue, where the marginal revenue equals marginal cost. Marginal cost happens to zero, but at price $6 and quantity 30 the marginal revenue is 5. This is ok, just as long as it comes closest to zero without going lower than the marginal cost, which in this case is zero. Thus, the two firms should split the production giving each firm 15 bushels priced at $6. Each company will make $90 each, half of $180.

b. Cheating firm: 20 x $5 = $100 & Other firm: 15 x $5 = $75.

c. Each firm: 20 x $4 = $80.

d. Part a. is a monopoly equilibrium, which one firm. However, the same could be said about a oligopoly, but the two firms must have a binding agreement otherwise, the two firms will both cheat and end up at part c, which is the Nash equilibrium.
Suppose that the president proposes a new law aimed at reducing healthcare costs: All Americans are required to eat one apple daily.

a. How would this apply-a-day law affect the demand and equilibrium price of apples?

b. How would the law affect the marginal product and the value of the marginal product of apple pickers?

c. How would the law affect the demand and equilibrium wage for apple pickers?

Solution:

a. The law requiring people to eat one apple a day increases the demand for apples. As shown in Figure 2, demand shifts from $D_1$ to $D_2$, increasing the price from $P_1$ to $P_2$, and increasing quantity from $Q_1$ to $Q_2$. Remember, $VMPL = P \times MPL$.

b. Because the price of apples increases, the value of 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 (current set of workers). 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 because of diminishing marginal product.

c. As figure below shows, the increase in the value of 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 $w_2$. 

3. This group of questions is taken from a series of topics throughout Chapter 19.
   a. Why do coal miners get paid more than other workers with similar amounts of education?
   b. How might education raise a worker’s wage without raising the worker’s productivity?
   c. Do the forces of economic competition tend to exacerbate or ameliorate discrimination on the basis of race?

Solution:
   a. Coal miners are paid more than other workers with similar amounts of education because their higher wage compensates them for the dirty and dangerous nature of coal mining, as well as their long-term health problems. As a result, they earn a sizable compensating differential.
   b. Education might raise a worker's wage without raising the worker's productivity if education works as a signal that the worker has high ability.
   c. The forces of economic competition tend to ameliorate discrimination on the basis of race, because business owners who care only about making profit are at an advantage when competing against those who also care about discriminating.
Consider two of the income security programs in the United States: Temporary Assistance for Needy Families (TANF) and the Earned Income Tax Credit (EITC).

a. When a woman with children and very low income earns an extra dollar, she receives less in TANF benefits. What do you think is the effect of this feature of TANF on the labor supply of low-income women? Explain.

b. The EITC provides greater benefits as low-income workers earn more income (up to a point). What do you think is the effect of this program on the labor supply of low-income individuals? Explain.

c. What are the disadvantages of eliminating TANF and allocating the savings to the EITC?

Solution

a. Since the woman receives a smaller TANF benefit when she earns a dollar more, she will be less likely to work. Thus, the labor supply of low-income women will be lower as a result of the TANF program.

b. If an individual would receive a greater benefit when he earns more income, he will be more likely to work. Thus, the EITC has a positive effect on the labor supply of low-income workers.

c. TANF provides a safety net for those who are less likely to be successful in the labor market.
5. Mario consumes only cheese and crackers.
   a. Could cheese and crackers both be inferior goods for Mario? Explain…
   b. Suppose that cheese is a normal good for Mario while crackers are an inferior good. If the price of cheese falls, what happens to Mario’s consumption of crackers? What happens to his consumption of cheese? Explain…
   c. Identify the total effect, substitution effect, and income effect on the graph. You can use the diagram that is provided.

Solution:
   a. Cheese and crackers cannot both be inferior goods, because if Mario's income rises he must consume more of something.
   b. If the price of cheese falls, the substitution effect means Mario will consume more cheese and fewer crackers. The income effect means Mario will consume more cheese (because cheese is a normal good) and fewer crackers (because crackers are an inferior good). So, both effects lead Mario to consume more cheese and fewer crackers.
The total effect is the measurement from the initial optimum to the new optimum. Here you see that the total quantity of crackers has decreased (inferior good) while the total quantity of cheese has increased (normal good). Now, you need to separate the substitution effect and income effect. Remember, total effect = income effect + substitution effect.

Next Step: You need to move the initial budget line and fit it tangent to the new indifference curve.