Question 1  A company decides to offer insurance against bicycle theft on campus. The company has determined that currently about 6 percent of bicycles get stolen per year. The average value of bicycles used on campus is 100 Dollars. Suppose the company offers complete insurance against bicycle theft for an annual premium of 10 Dollars. That is, if a person is insured and his/her bicycle is stolen, then the person will receive an insurance payment that is equivalent to the value of the stolen bicycle.

The company believes that it will make a profit of 2 Dollars per person, because the expected payment per costumer is 0.06(100) = 6. In the box explain why the company’s profit per costumer may be significantly lower (or negative).  

8 points
Question 2 There are two firms $A$ and $B$ that sell PCs. Firm $A$ produces high quality PCs at a cost of 1,500 Dollars. Firm $B$ produces low quality PCs at a cost of 1,300 Dollars. If consumers knew the quality of the PCs they were buying, they would be willing to pay 2,500 Dollars for high quality PCs and 700 Dollars for low quality PCs. However, without more information consumers do not know that firm $A$ produces high quality PCs and that firm $B$ produces low quality PCs. Instead, consumers believe that there is a 50 percent probability that a firm produces a high quality PC. As a consequence, their willingness to pay is 1,600.

(a) Does there exist a price at which both firm’s $A$ and $B$ can sell their PCs without losing money (Mark the correct answer)  

| Yes, at any price $\leq p \leq$ | No, there is no such price |

(b) Now suppose that each firm can offer a warranty. If firm $A$ offers a warranty lasting $Y$ years, then firm $A$’s expected cost is $50Y$. If firm $B$ offers a warranty for $Y$ years, then its cost is $150Y$. Suppose that if a consumer knew the quality of the PC then the warranty would not change the consumer’s willingness to pay. Suppose that firm $A$ offers a three year warranty and sells PCs for a price of $P_A$. Note that if it is optimal for firm $B$ to sell PCs without warranty, then consumers will know that $A$’s PCs are high quality and $B$’s PC are of low quality. Find a price $P_A$ such that $A$’s profits are strictly positive, and such that is not optimal for $B$ to offer a three year warranty for its PCs.  

$P_A =$
Question 3  Fill in the missing entries in the table below  

<table>
<thead>
<tr>
<th>Quantity of variable input</th>
<th>total output</th>
<th>marginal product of variable input</th>
<th>average product of variable input</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>60</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 4  A production function is given by \( f(K, L) = 4K^{0.5}L \). Suppose that the firm currently uses 100 units of capital and 40 units of labor. Then the marginal products of capital and labor are

\[
\text{MP}_K(100, 40) = \quad \text{and} \quad \text{MP}_L(100, 40) = .
\]

The average product of capital and labor are

\[
\text{AP}_K(100, 40) = \quad \text{and} \quad \text{AP}_L(100, 40) = .
\]
Question 5 Suppose that a firm’s cost function is given by $C(Q) = 2,000 + 10Q + 0.1Q^2$. The firm currently produces 20 units of output. Then

- **Average variable costs are** .  
- **Marginal costs are** .  
- **Fixed costs are** .

3 points

3 points

3 points

Question 6 Suppose that a firm’s cost function is given by $C(Q) = 40Q + 4Q^2$. Then the firm’s competitive supply function is given by

**$Q^S(P) =$** .

9 points

Question 7 Now suppose that a firm’s cost function in a competitive industry is given by $C(Q) = 64 + Q^2$. In order for the firm to make positive profits, the price $P$ must be at least .

10 points
Question 8 Demand for a product sold in a competitive market is $Q(P) = 1,000 - 300P$. There are 100 firm producing the product. Each firm’s cost function is $C(Q) = 4Q + 0.25Q^2$. Determine the price $P$ in the competitive equilibrium (i.e., the price were demand equals supply).

The equilibrium price $P = \phantom{0}$. 

10 points
Question 9 Microsoft sells the Home edition of Windows XP for 100 Dollars. Suppose that the marginal cost of producing and shipping a CD with the operating system is 10 Dollars. Thus,

The price elasticity of demand is .

4 points

Competition would make demand more elastic. Suppose that the if Linux can successfully penetrate the consumer market, the price elasticity of demand for Windows XP would change to $-1.25$. Then,

The price of a copy of Windows XP would be .

4 points

Suppose that annual demand for Windows XP is 100 Million in both cases. Then

Microsoft would lose Dollar .

2 points
Question 10 Consumers’ aggregate demand and a monopolist’s marginal costs are depicted below.

\[ P, \text{ Costs} \]

Suppose the firm charges a price \( P \) per unit that maximizes profits. Then

\[
P = \quad \text{and the firm’s revenue is} \quad 5 \text{ points}
\]

Suppose the firm does two part pricing, i.e., charges a fixed fee and a price per unit \( P' \).

Then \( P' = \quad \text{and the firm’s revenue is} \quad 5 \text{ points} \)
Question 11  
This question shows that in the presence of fixed costs, competition may lead to an inefficient outcome.

Suppose the cost function of an airline that offers service between Champaign and Chicago is given by \( C(Q) = 20,000 + 50Q \), where \( Q \) is the number of passengers. Demand is given by \( P = 200 - 0.1Q \). The profit maximizing price of a ticket is therefore \( P = 125 \) and \( Q = 750 \). Now suppose a second airline with the same cost function also starts to offer service. As a consequence of the increased competition the price of a ticket now drops to \( P = 100 \) and \( Q = 1,000 \).

10 points

The consumers’ net benefit in the monopoly case is .

The consumers’ net benefit with two airlines is .

Firm profits in the monopoly case are .

Suppose that each airline receives half of the demand, i.e., 500 passengers.

Aggregate firm profits with two airlines are .

From the above you can conclude that in the monopoly case, consumer + producer surplus is by higher than if there are two firms.