Economics 101  
Fall 2000  
Practice Questions #4

Goal:
- Learn how competitive firms decide what is the profit-maximizing output level and how much is the economic profit.
- Examine how competitive firms decide when to shut down the business or when to enter the market.
- Inspect how the competitive market and individual firms in a competitive market operate in the short run and in the long run.

1.

\[ egin{array}{c|c|c|c|c|c|c} 
\text{P} & \text{D} & \text{S} & \text{MC} & \text{ATC} & \text{AVC} \\
\hline 
\$20 & \text{1000} & & & & \\
\$15 & & & & & \\
\$12 & & & & & \\
\$10 & & & & & \\
\$8 & & & & & \\
\end{array} \]

(a) Market

\[ 
\begin{array}{c|c|c|c|c|c|c} 
\text{Q} & 6 & 8 & 10 & 12 & 14 & 16 \\
\hline 
\text{MC} & & & & & & \\
\text{ATC} & & & & & & \\
\text{AVC} & & & & & & \\
\end{array} \]

(b) Firm A

In the above figure, panel (a) shows the equilibrium in a competitive market and panel (b) shows the cost structure of a representative competitive firm A.

Answer the following questions.

a. What is the profit-maximizing output level for firm A?
b. At the output level you got in a, calculate the following numbers:
   - Total revenue (TR) = _______, Total cost (TC) = _______, TVC = ________, 
   - TFC = ________, AVC = _______, AFC = ________, total economic profit = ________.
c. What is the shutdown price? _______ What is the break-even price? ________
d. In the short run, will firm A stay in this market? Show what happens to panel (a) and (b) when other firms enter into the market. What happens to the total economic profit of
firm A and the total number of firms in this market in the long run? Mark the long-run market supply curve.

2. In a perfectly competitive market, the demand and supply function are as follows:
   \[
   \begin{align*}
   \text{Supply:} & \quad P &= 0.03Q \\
   \text{Demand:} & \quad P &= 50 - 0.02Q
   \end{align*}
   \]
   Look at a representative competitive firm B. The total cost (TC) when firm B produces \(Q_B\) is \(TC = 5Q_B^2 + 3\) and thus the marginal cost (MC) is \(MC = 10Q_B\) (Check it if you've learned Calculus).
   Answer the following questions.

   a. What is the demand function facing firm B?
   b. Use the MR and MC approach to determine the profit-maximizing output level for firm B.
   c. What is the average total cost (ATC) function? What is the average variable cost (AVC) function? How much is the fixed cost?
   d. Compute the profit (or loss) per unit and the total economic profit at the profit-maximizing output level.
   e. Should firm B shut down the business in the short run? What is the shut down price?

3. Suppose the market for coffee is perfectly competitive and is presently in long-run equilibrium, as shown in the following figure.

   Firm C is a typical firm in this market and we assume that presently all firms in this market are identical (i.e. they have the same cost function). Assume this is a constant-cost industry.
Analyze the impact, *both in the short run and in the long run*, on the market equilibrium as well as firm C’s profit-maximizing output level and total economic profit, due to the following respective changes.

a. Demand for coffee increases due to the growth of income.

b. A new technology which can reduce average total cost by $1 per pound is developed by firm C.

c. An (permanent) excise tax of $1 per pound is imposed on every producer of coffee.

d. A (permanent) price ceiling of $9 per pound is established in this market.

e. Demand for coffee decreases because more tea products are introduced.

4. Suppose there are two types of competitive firms in an industry. Both provide standardized products, but firms of type D have shared a technology to save costs and this technology is protected in a way that it is not available for firms of type E in the short run. We assume there are many firms of either type inside and outside the market. The following table is the information of their cost structures.

<table>
<thead>
<tr>
<th>Q</th>
<th>Type D</th>
<th>Type E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
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<td>60</td>
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<tr>
<td>5</td>
<td>80</td>
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</tr>
<tr>
<td>6</td>
<td>114</td>
<td>144</td>
</tr>
</tbody>
</table>

a. Finish all the blanks in table. Sketch the ATC, AVC, and MC curves of type D and type E separately.

b. In the short run, when the market price is $24, firms of which type will stay in the market? Compute the profit-maximizing output level and total economic profit of those firms staying in the market.

c. In the short run, when the market price is $14, firms of which type will stay in the market? Compute the profit-maximizing output level and total economic profit of those firms staying in the market.

d. In the short run, when the market price is $10, firms of which type will stay in the market? Compute the profit-maximizing output level and total economic profit of those firms staying in the market.

e. Approximately, what will be the long-run equilibrium price?