I. Multiple Choice Questions

1. b) WHY? Cost minimizing and profit maximizing are the same thing. Thus, if a firm buys all the right inputs (i.e. by setting $\text{MRP}_f = P_f$), then the output made by those inputs will be such that the firm is profit maximizing, meaning $P = MC$. Less intuitively, we can rewrite $\text{MRP}_f = P_f$ as $\text{MP}_f * P = P_f$ and then again as $P = \text{P}_f / \text{MP}_f = MC$.

2. c) WHY? This is just like a capital investment decision (in fact, labor economists refer to it as a human capital investment), so Nick should spend the $250,000 now, as long as the present discounted value of the stream of benefits is not less than $250,000. Conveniently, Nick is a vampire, so that rather than having to calculate $\sum_{t=0}^{\infty} \frac{25,000}{(1+r)^t}$, we can calculate the infinite sum as $\frac{25,000}{r}$ for any interest rate r. If $r=.10$, then this would be $250,000$ and it would be just worth going to school. If $r>.10$ this would be less than $250,000$ and it would definitely not be worth going, and if $r<.10$ then this would be greater than $250,000$ and it would definitely be worth investing in a law school education.

3. b) WHY? We know that the efficient amount of output is being produced if MSB=MSC, meaning in this case that we should have $\text{MU}=\text{MC}$. Instead, we have $\text{MU}>\text{MC}$ meaning we need to move down the demand curve and up the marginal cost curve by producing more.

4. c) WHY? Profit maximizing means choosing output so that $MC=MR$. If demand is relatively inelastic, then $MR$ must be negative. Since $MC$ is positive, a monopolist will always operate on the relatively elastic portion of the demand curve, so that $MC=MR$. Intuitively, the monopolist will never be on the bottom half of the demand curve, since producing less would mean lower total costs, and higher total revenues.

5. a) WHY? Any profit maximizing firm wants to choose the quantity where $\text{MR}=\text{MC}$, and then the price will come from the demand curve at that quantity, so $P>\text{MC}$. Since the firm is at minimum ATC, then $\text{MC}=\text{ATC}$, implying that $P>\text{ATC}$. Thus positive profits are earned.

6. b) WHY? Since there is freedom of entry and exit, there are zero profits in the long run, so $P=\text{ATC}$. Since products are differentiated, the firm faces a downward sloping demand curve, so the tangency of demand and ATC is above the minimum ATC of $2$.

II. Short Answer Question

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>Total Cost</th>
<th>Marginal Cost</th>
<th>Avg Total Cost</th>
<th>Marginal Revenue</th>
<th>Average Revenue</th>
<th>Economic Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20</td>
<td>90</td>
<td>$900</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
<td>$900</td>
</tr>
<tr>
<td>$15</td>
<td>50</td>
<td>$750</td>
<td>$7.50</td>
<td>$15</td>
<td>$7.50</td>
<td>$7.50</td>
<td>0</td>
</tr>
</tbody>
</table>
The two tables are filled in the same way, as shown. Since \( P > MC \) we know it cannot be a perfectly competitive market. Since there are zero profits in the LR, firms must have entered, meaning it is a monopolistically competitive market, rather than a monopoly or an oligopoly.

### III. In-Depth Problem

1. **a)** In order to operate the market like a monopoly, the government needs to base decisions on the industry demand. We can fill in MR for the industry by remembering that for a straight-line demand curve, MR is twice as steep, cutting the axis at the midway point as shown. Now, since \( MR = MC \) at \( Q = 20 \), that is the proper industry level of output, so each of the 100,000 firms should be given 20 licenses. The price is read off of the demand curve and is $8, so the firm faces a flat demand curve at $8. Note, though, that MC is only $6 at this quantity.

   ![Graph](image)

   **Sugar Industry**

   **Representative Sugar Producer**

   b) If the market was perfectly competitive, the price would be $7 and 30 tons would be produced by each firm, as can be seen by the intersection of industry supply and demand (same as in Problem Set 3!). The sum of consumer and producer surplus would be the entire shaded area above. Consumer surplus would be the triangle above $7 and below the demand curve, and producer surplus would be the triangle below $7 and above the supply curve. Now, with the industry acting like a monopolist, consumer surplus is the triangle above $8 and below demand (shaded with horizontal stripes) and producer surplus is the area below $8 and above the supply curve (shaded with diagonal stripes). With the monopoly outcome, there is now a deadweight loss (the darker shaded triangle) indicating that society is worse off under this licensing program than under perfect competition.