ECON 415
Firms, Markets and Industry Structure

Second Midterm: elements of answer

Exercise 1.

<table>
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<th>R</th>
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<tbody>
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<tr>
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<td>4</td>
<td>1, 2</td>
<td>2, 3</td>
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<tr>
<td>B</td>
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Strategies that survive iterated elimination of strictly dominated strategies are $T$ for 1 and $L$ and $R$ for 2.

There are 2 pure NE: $(M, L)$ and $(T, R)$.

Exercise 2.
Third degree price discrimination

The demand for college education may depend on both price (tuition) and income. If we assume that income raises the demand for education, then richer students will demand more education (than the poorer students) at any price level. If the price elasticity for the rich students is less that the poor students (e.g.' linear demand) then a higher price should be charged to the rich students.

Data on the income of students (and their families) attending universities with different level of tuitions could be used.

Exercise 3.

1) Cournot Equilibrium.

The demand is $P = 500 - 20Q$ where $Q = Q_1 + Q_2$, $Q_1$ is the number of bottle of wine produces and sold per month by Aubonvin, and $Q_2$ is the number of bottles of wine produced and sold per month by Wineryplus. $MC = 20$.

The program of firm 1 is

$$\max_{Q_1} \{\Pi_1(Q_1, Q_2) = P(Q_1, Q_2)Q_1 - 20Q_1\}$$

$$\Rightarrow \max_{Q_1} (500 - 20(Q_1 + Q_2))Q_1 - 20Q_1$$

The FOC

$$\frac{\partial \Pi_1(Q_1, Q_2)}{\partial Q_1} = 500 - 40Q_1 - 20Q_2 - 20 = 0$$

Solution is:

$$Q_1 = 12 - \frac{1}{2}Q_2$$

This is the best response of firm 1 to quantity $Q_2$. Because firms are symmetric, same best response function for 2:

$$Q_2 = 12 - \frac{1}{2}Q_1$$

Then plug (1) in (2) gives:

$$Q_2^c = 8$$

Thus

$$Q_1^c = 8$$
The price is

\[ P^c = 500 - 20Q = 500 - 40 \times 8 = 180 \]

The profit of each firm is

\[ \Pi_1(Q^c_1, Q^c_2) = P^c Q^c_1 - 20Q^c_1 = (180 - 20)8 = 1280 \]

Same profit for firm 2.

2) Stackelberg

Best response of firm 2 is

\[ Q_2 = 12 - \frac{1}{2}Q_1 \]

that we plug into firm 1’s profit

\[ \Pi_1(Q_1, Q_2) = (500 - 20Q_1 - 20(2 - \frac{1}{2}Q_1) - 20)Q_1 \]

The maximization program of firm 1 becomes

\[ \max_{Q_1} \Pi_1(Q_1, Q_2) = (240 - 10Q_1)Q_1 \]

FOC

\[ 240 - 20Q_1 = 0 \]

\[ Q^S_1 = 12 > Q^c_1 = 8 \]

and

\[ Q^S_2 = 12 - \frac{1}{2}12 = 6 < Q^c_2 = 8 \]

The price is

\[ P^S = 500 - 20 \times 12 - 20 \times 6 = 140 < 180 \]

the profit of each firm is

\[ \Pi^S_1 = (140 - 20)12 = 1440 > 1280 \]

\[ \Pi^S_2 = (140 - 20)6 = 720 < 1280 \]

c) Bertrand Paradox

\[ P = 20 \]

and quantities are

\[ 20 = 500 - 20Q \]

\[ Q = 24 \]

\[ Q_1 = Q_2 = 24 \]