EC3322
Industrial Organization I
Semester 2, 2010-2011
Midterm Solutions
March 2, 2011

1. (a) If you buy one pair of Levi jeans, you can buy a second pair at half price. **This is an example of quantity discounting, a characteristic of second-degree discrimination.**

   (b) Senior citizens pay \$0.50 for a cup of coffee at McDonald's, but everyone else pays \$1. **This is group pricing or third-degree discrimination.**

   (c) Five tickets to the World Cup are auctioned to the highest bidders. The tickets sell for \$12,000, \$11,990, \$11,980, \$11,975, and \$11,970. **The bids will be related to each person's willingness to pay so this is an example of first-degree discrimination.**

2. First, derive the profit function of firm 1:

$$\pi_1 = (p - MC)\, q_1 = (100 - 2q_1 - 2q_2 - 2q_3 - 20)\, q_1 = (80 - 2q_1 - 2q_2 - 2q_3)\, q_1$$

   Then, find the first-order condition:

$$\frac{\partial \pi_1}{\partial q_1} = 80 - 4q_1 - 2q_2 - 2q_3 = 0.$$

   Now impose symmetry: $q^* \equiv q_1^* = q_2^* = q_3^*$ to find each firm's output, $q^* = 10$. The N.E. is $q_1^* = 10, q_2^* = 10, q_3^* = 10$ and price is $p^* = 40$.

3. (a) Since $MR > MC$ for $Q \leq 30$, the firm finds it profitable to provide $Q^* = 30$. Substitute Q^* into the inverse demand function to find price is $P^* = 70$.

   (b) Since the willingness to pay is greater than MC for $Q \leq 30$, the social planner will also provide $Q^W = 30$. Therefore, deadweight loss is zero.

   (c) See graph below.

4. (a) The N.E. is (US plays Low, Japan plays High).

   (b) See the game tree and matrix below.

(c) The Nash equilibria are (US plays Low, Japan plays High if US plays Low, Japan plays High if US plays High) and (US plays High, Japan plays High if US plays Low, Japan plays Low if US plays High).

(d) The SPNE is (US plays High, Japan plays High if US plays Low, Japan plays Low if US plays High). The outcome is that US plays High and Japan plays Low, and the payoffs are $(3, 2)$.

5. (a) Since we're told that $p = 8$, $q_1 = 48$ and $q_2 = 19$. To find the optimal fee, we first compute consumer surplus for each consumer. Consumer 1's consumer surplus is $CS_1 = (200 - 8) * 48/2 = 4608$, and consumer 2's consumer surplus is $CS_2 = (122 - 8) * 19/2 = 1083$. The fee should be set equal to the smaller consumer surplus to ensure that both consumers buy the product: $F = 1083$. Profit is $\pi^* = 2 \cdot F = 2166$.

(b) If the monopolist sells only to consumer 1, the fee is $F = 4608$ and profit is $\pi^* = F = 4608$, which is greater than the profit found in part (a).

6. (a) First, set up the profit function:

$$\pi = z\,(1 - q)\,q - z^2 q.$$

Then, derive the first-order conditions:

$$\frac{\partial \pi}{\partial z} = (1 - q)\,q - 2zq = 0 \quad \text{and} \quad \frac{\partial \pi}{\partial q} = z\,(1 - 2q) - z^2 = 0.$$

Solve to find that $z^* = q^* = 1/3$. Substitute z^* and q^* into the inverse demand function to find price $p^* = 2/9$.

(b) Consumer surplus is

$$CS = \frac{1}{2} \cdot \left(\frac{1}{3} - \frac{2}{9}\right) \cdot \frac{1}{3} = \frac{1}{54}.$$

Profit is

$$\pi = \frac{1}{3} \cdot \frac{2}{9} - \left(\frac{1}{3}\right)^2 \cdot \frac{1}{3} = \frac{1}{27}.$$

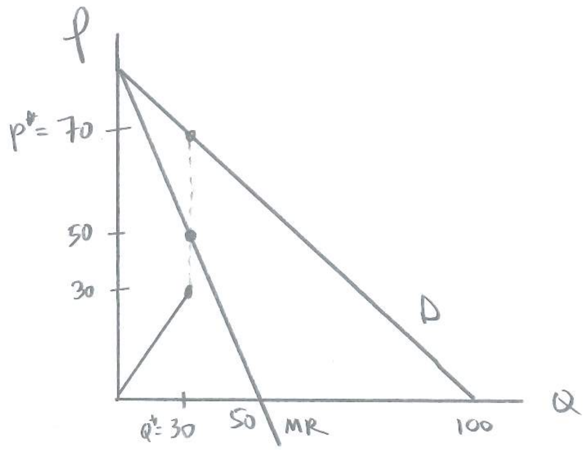
(c) To find the socially optimal quality at $q = 1/3$, first derive total welfare as total gross benefit minus total cost of production:

$$W = \frac{1}{2} \cdot \frac{1}{3} \cdot \left(z + \frac{2}{3}z\right) - \frac{1}{3} \cdot z^2 = \frac{5}{18}z - \frac{1}{3}z^2.$$

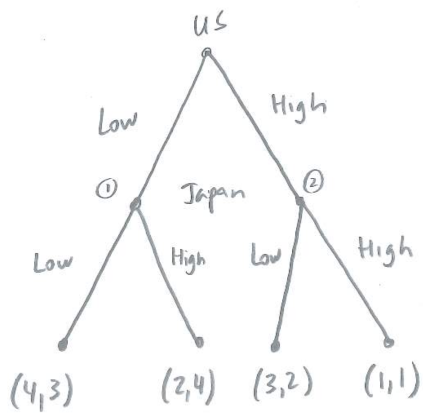
Maximize to find z^W:

$$\frac{dW}{dz} = \frac{5}{18} - \frac{2}{3}z = 0 \Rightarrow z^W = \frac{5}{12}.$$

3c)



4b)



Japan

		Low at 1 Low at 2	Low at 1 High at 2	High at 1 Low at 2	High at 1 High at 2
US	Low	4,3	4,3	2,4	2,4
	High	3,2	1,1	3,2	1,1