EC3322
Industrial Organization I
Semester 2, 2013-2014
Midterm Exam Solutions

1. b

2. d

3. b

4. True since demand is inelastic for prices less than 50.

5. (a) Aggregate demand is

$$Q = \begin{cases} 100 - 2p & , \quad 40 \leq p \leq 50 \\ 180 - 4p & , \quad p < 40 \end{cases}$$

and marginal revenue is

$$MR = \begin{cases} 50 - Q & , \quad Q < 20 \\ 45 - .5Q & , \quad 20 \leq Q \leq 180. \end{cases}$$

(b) The marginal cost curve crosses the lower portion of the marginal revenue curve. Solve to find $Q^* = 80$ and $P^* = 25$.

(c) Derive marginal revenue and set it equal to the marginal cost to find $Q_E^* = 45$ and $P_E^* = 55/2$.

(d) Again, derive marginal revenue and set it equal to the marginal cost to find $Q_S^* = 35$ and $P_E^* = 45/2$.

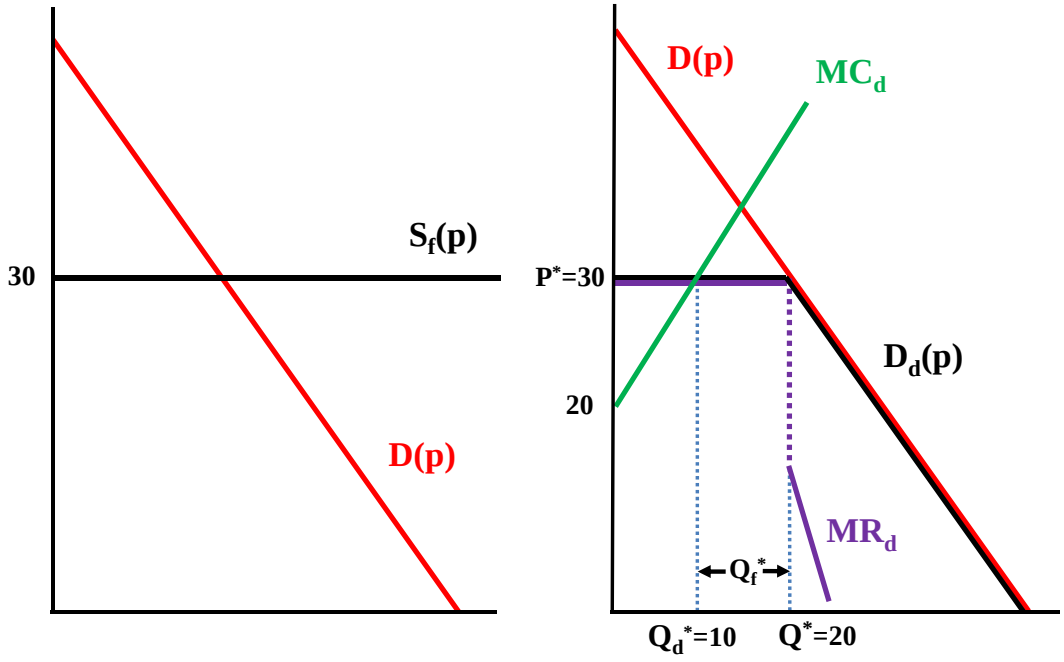
6. (a) In the long run, a firm chooses quantity such that $P = MC$ as long as P is greater than the minimum average cost. Find the minimum average cost by setting the derivative of the average cost function with respect to q equal to zero and solving for q, which is $q = 10$ at an average cost of 30. Thus, the supply function of a fringe firm in the long run is

$$q_f = \begin{cases} \dfrac{p - 10}{2} & , \quad p > 30 \\ 0 & , \quad p \leq 30. \end{cases}$$

(b) Long run aggregate supply of the fringe is horizontal at the minimum AC, 30.

(c) The dominant firm's demand is horizontal at $P = 30$. Below 30, it is equal to market demand.

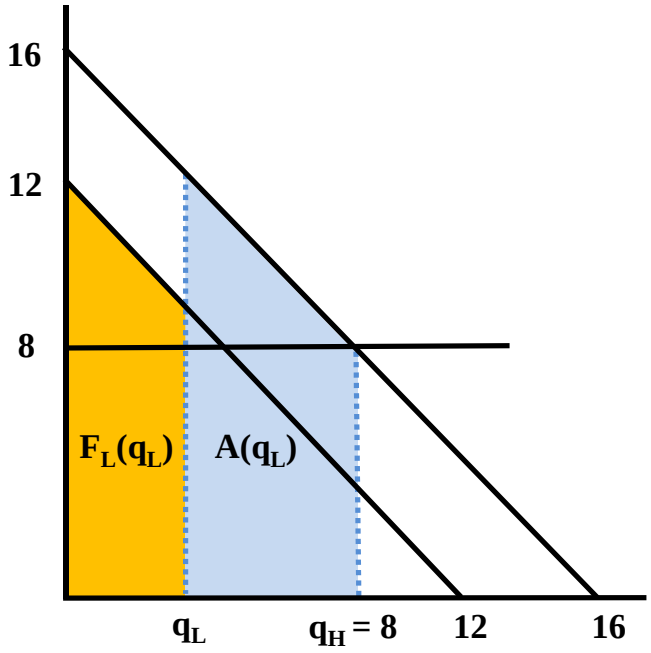
(d) The MC of the dominant firm is $MC = 20 + q$. Notice from the graph that it crosses the horizontal part of residual demand. Therefore, $P^* = 30$ and the number of units purchased is $Q^* = 20$. Of these, 10 units are sold by the dominant firm with the remaining 10 sold by the fringe.



7. The optimal block pricing packages under second-degree price discrimination will have the following features:

- The quantity of the high demand package is the efficient amount of quantity for the high demand person.
- The low-demand persons will receive no consumer surplus.
- The high-demand person receives the same surplus from buying the high demand package as from buying the low demand package.

With this information we can draw the graph:



Notice, that using the above information, we can write the fees and quantities as a function of a single variable, q_L (the number of units in the low-demand package). From the graph, $F_L(q_L) = 12q_L - \frac{1}{2}q_L^2$ and $A(q_L) = 96 - 16q_L + \frac{1}{2}q_L^2$. The fee for the high-demand package is then $F_H(q_L) = F_L(q_L) + A(q_L) = 96 - 4q_L$.

The monopolist's profit is

$$\pi(q_1) = 2F_L(q_L) + F_H(q_L) - 8(8 + 2q_L) = 4q_L - q_L^2 + 32.$$

Maximize profit to find $q_L^* = 2$. The fees are found by plugging in for q_L.

(a) The package designed for the low-demand persons is 2 units for 22.

(b) The package designed for the high-demand person is 8 units for 88.

(c) The monopolist earns profits of 36.