100 points = 100%
103 points = 103% 

Show all work. Write legibly.

Calculators permitted.

No computers.
1. (24 points total) A monopoly producer of music videos is able to sell the videos to TV stations and also to individual consumers. Because TV stations have special formatting and quality requirements, producers are able to separate these two types of consumers and sell them essentially the same product at two different prices. You are given the following demand curves per year for these distinct markets:

TV stations: $P_1 = 80 - 0.01Q_1$
Individual consumers: $P_2 = 60 - 0.01Q_2$

where $P$ refers to prices charged to each group and $Q$ refers to quantities demanded by each group. The variable and marginal cost of producing music videos (once the video has been shot) is uniform at $4 per video (essentially the cost to produce a physical copy of the video). In addition there are sunk fixed costs of $20,000 for the shooting of such video (for design, promotion and hiring artists).

a) (5 points) If the producer of music videos can price discriminate by charging different prices to each group, calculate the profit-maximizing price charged and quantity sold to TV stations.

b) (5 points) If the producer of music videos can price discriminate by charging different prices to each group, calculate the profit-maximizing price charged and quantity sold to individual consumers.
c) **(2 points)** This is an example of what kind of price discrimination?

d) **(3 points)** Calculate total profits from selling to both types of customers.

e) **(9 points)** Calculate the price elasticities in each of the markets at their equilibrium levels. Intuitively explain the relationship between the price and price elasticity in each of the markets.
2. **(Total 16 points)** You are the head of the marketing division of Netflix, the movie subscription company. The marketing department has provided you with the following key items of information about their combination DVD-and-Streaming subscription (which happens to be the most popular plan with customers):

- Monthly ARPU (average revenue per unit): $13
- Monthly Cost-to-Serve: $5
- Acquisition cost of each additional customer: $40
- Interest rate: 3%
- Loss of customer base per month (churn rate): 4%

a) **(5 points)** Calculate the time required to break even on the acquisition cost.

b) **(11 points)** With this subscription based pricing scheme, the monthly margin per Netflix consumer is relatively fixed across periods. Calculate the Lifetime Value of a Customer (LTV).
3. (Total 14 Points) The pie graph below represents the market shares of wireless subscriptions held by carriers in the U.S. in 2014.

![Pie chart showing market shares of wireless subscriptions in 2014.]

a) (8 points) Calculate the Herfindahl-Hirshman Index in this industry. What does HHI measure? What can you tell about this industry from your calculated HHI?
b)  **(6 points)** What is the CR4 for this industry? What kind of information does HHI reflect that CR4 does not?

4.  **(Total 18 Points)** TWD is a cable company that has a local monopoly in cable TV and high-speed Internet. Assume that the marginal cost of producing either good is zero and that there are no other costs. There are three customers, A, B and C with different reservation prices for the two goods. The reservation prices are as follows:

<table>
<thead>
<tr>
<th>Customer</th>
<th>Reservation Price for Cable TV</th>
<th>Reservation price for High Speed Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

a)  **(7 points)** Suppose the goods are offered separately. Compute the profit maximizing prices for Cable TV and High Speed Internet
b) **(7 points)** Now assume that both goods are offered only as a bundle, but not separately. Compute the profit-maximizing bundle price.

c) **(4 points)** Explain under what conditions profits are larger with bundling. Is this the case with this example?
5. **(Total 12 points)**. Consider the Atlantic Article “Have you Ever Tried to Sell a Diamond”. Answer the following questions:

a) **(6 points)** List at least three factors discussed in the article that had a potential to affect the price of diamonds.

b) **(6 points)** Briefly explain the mechanisms through which these factors affected diamond prices.
6. (Total 16 Points) Assume that a cell-phone provider can identify and separate the low demand (e.g. students and senior citizens) and high demand (e.g. working households) consumers perfectly (i.e. by asking them to show student or senior citizen IDs). The marketing department presented you with the following demand graphs for both types of potential consumers:

(a) Low-demand consumer

(b) High-demand consumer

a) (4 points) What is the optimal two part tariff for low demand consumers (price per minute and fixed fee)?

b) (4 points) What is the optimal two part tariff for high demand consumers (price per minute and fixed fee)?
c) (8 points) Suppose that this cellphone provider cannot differentiate between the types of customers. Suggest at least 2 alternative pricing plans that would earn more revenue than just charging the pricing plan designed for low income customers (that you calculated in part (a)). If well explained, using precise numbers is not necessary. Briefly discuss the intuition behind your proposed pricing plans.

Optional. Extra credit:

7. (Bonus 3 points). Mathematically derive Lerner’s Index.