Problem Sets 9

Due in class Dec 3 F

1. UltraClean and Biobase are the only two producers of chlorine for swimming pools. The market demand for chlorine is $P=32-2Q$, where Q is measured in tons and P is dollars per ton. The corresponding marginal revenue curve is $MR=32-4Q$. Assume that chlorine can be produced by either firm at a constant cost of $16 per ton.

1) If the two firms collude and act like a monopoly, agreeing to evenly split (Q/2) the market, how much will each firm produce and what will the unit price be? How much profit will each firm earn?
2) Does UltraClean have an incentive to cheat on this agreement by producing an additional ton of chlorine? Explain. [Hint: Calculate the profit in this case versus even Q and compare the profits.]
3) Does UltraClean's decision to cheat affect Biobase's profit? Explain.
4) Suppose that both firms agree to each produce 1 ton more than they were producing in part (1). How much profit will each firm earn? Does UltraClean now have an incentive to cheat on this agreement by producing another ton of chlorine? Explain.

2. Biwei's firm Metaverse faces a demand curve for its product of $P=100-10Q$, which is also the firm's average revenue curve. The corresponding marginal revenue curve is $MR=100-20Q$. Assume that the firm faces a marginal cost curve of $MC=10+10Q$.

1) If the firm cannot price-discriminate, what is the profit-maximizing level of output and price? [Hint: the firm can only charge a single unit price (the same) on all customers.]
2) If the firm cannot price-discriminate, what are the levels of consumer and producer surplus in the market, assuming the firm maximizes its profit? Calculate the deadweight loss from market power.
3) If the firm has the ability to practice perfect price discrimination, what is the firm's output?
4) If the firm practices perfect price discrimination (fully extract consumer surplus according to their marginal use values), what are the levels of consumer and producer surplus? What is the deadweight loss from market power?

3. A monopoly firm, Alex Inc., can set price in the apple market with marginal cost of $5. The weekly market demand, consumer, and producer cost-benefit schedules are given in the table.

Demand Schedule	Quantity	1	2	3	4	5	6	7	8
	Market price $	8	7.5	7	6.5	6	5.5	5	4.5
Consumer (Biwei)	Marginal Use Value	8	7.5	7	6.5	6	5.5	5	4.5
	Total Use Value	8	15.5	22.5	29	35	40.5	45.5	50
	Consumer Surplus	0							
Producer (Alex)	Total Revenue	8	15	21	26	30	33	35	36
	Marginal Revenue	8	7	6	5	4	3	2	1
	Average Cost	5	5	5	5	5	5	5	5
	Total Cost	5	10	15	20	25	30	35	40
	Producer Surplus	3							
	Market Welfare	3							

Note: all the numbers except the quantity demanded are in terms of dollars.

1) Suppose Biwei is the only consumer in the apple market, why is his marginal use value equal to the apple price? Calculate his consumer surplus (net gain from consumption) and fill in the table. How many apples he would like to buy per week?
2) As the only producer in the apple market, at what price, how many apples would Alex sell per week in order to maximize his economic profit? Calculate his producer surplus.
3) Consider the society as a whole, calculate the total welfare (total use value minus total production cost) and fill in the table. From the society's point of view, what is the optimal amount of apple that shall be produced? What is the amount of deadweight loss arising from monopoly decision compared with the social optimum?
4) To extract consumer surplus, the monopoly firm can charge differential prices on different costumers along the demand schedule (e.g., coupon, student discount, VIP price) according to their marginal use value. Or, it can provide discounts for additional quantities purchased. By adopting these strategies, can Alex potentially remove the deadweight loss under monopoly? Explain.
5) Another strategy Alex can increase his economic profit is to set an all-or-nothing price lower than the monopoly price. The all-or-nothing pricing strategy requires a consumer to buy all the apples at a given price. If Alex sets the all-or-nothing price at $6.25, calculate the economic rent and consumer surplus under all-or-nothing pricing for different quantities. What is the optimal all-or-nothing quantity Alex should sell to maximize economic profit? Is it socially optimal?
6) Is the all-or-nothing strategy more efficient than monopoly decision for the society? Explain.