Problem Set #5

Doing these problems is optional. The solutions to these questions will be posted by Thursday, October 8th and discussed in section on Friday, October 9th. As always, the educational value of these exercises will be maximized if you attempt to answer these questions before you look at the answers.

Question 1

Two companies, Luxor and Candel, have decided to enter the light bulb market in Berserkistan (there are currently no light bulbs in Berserkistan). They can enter in two ways: with or without a massive advertising campaign. A massive advertising campaign costs $1 million. There are 10 million consumers in Berserkistan, each of whom would be willing to buy one light bulb at price $1. The marginal cost of producing light bulbs is always $0.50, and the fixed cost of operating in Berserkistan is $0.5 million. If both firms advertise or if neither firm advertises then the consumers will be equally split between the two companies. However, if only one of the companies advertises, then that company will get 80% of the consumers. (Assume that $1 is the only price that either of the companies would ever consider charging, that firms know each others' payoffs, and that this is a one-time interaction).

a. Write down the normal form (or payoff matrix) of this game in terms of profits, showing the players, the actions, and the payoffs.

b. Are there dominant strategies in this game (why or why not)? What is/are the equilibrium of this game?

c. How would the original game and the equilibrium change if you added a third strategy for both, namely that of not entering at all? (If only one firm enters, it gets all of the customers).

d. Discuss briefly how the situation might change if, in addition to considering entry into Berserkistan, Luxor and Candel expect there to be a large (but unknown) number of other potential markets that will become ripe for them to enter at some point in the future.
Question 2

Your business is one of three businesses competing for a license to produce a new medical device. The seller of the license is offering it for sale using an auction.

a. Imagine that you are certain (really certain!) that the future profit from having the license is $2,000,000. If the seller is using a second-price sealed bid auction, how much should you bid? Why?

b. Given the scenario in (a), would you benefit from learning the values that your competitors estimated as the profitability from having the license? Why?

c. Does your answer to (a) change if the seller is using a first-price sealed-bid auction? Why or why not?

Question 3

In a market with annual demand \( Q = 100 - P \), there are two firms, A and B, that make identical products. Because their products are identical, if one charges a lower price than the other, all consumers will want to buy from the lower-priced firm. If they charge the same price, consumers are indifferent and end up splitting their purchases about evenly between the firms. Each firm has capacity to produce up to 100 units per year and has an additional marginal cost of production of 10 per unit. Firms build capacity first and then set price for each year. No other firms can enter this market. Both firms know all of this information.

a. Given the capacities they have built, what is the single-period (oneshot) Nash equilibrium price in this market now?

b. If the two firms could collude perfectly, what is the joint profit-maximizing price the two firms would charge?

c. Assume that each firm can monitor the other’s price very closely and can respond instantly (before any consumers make a purchase decision) to a price change. Explain why one repeated-game Nash equilibrium is for both firms to charge the price you answered in (b).

d. If market demand were expected to decline starting next year and eventually disappear entirely, how would that affect the price that the firms could maintain today?

Question 4

NSG is considering entry into the local phone market in the Bay Area. The incumbent, S&P, predicts that a price war will result if NSG enters. If NSG stays
out, S&P earns monopoly profits valued at $10 million (NPV of profits), while NSG earns zero. If NSG enters, it must incur irreversible entry costs of $2 million. If there is a price war, each firm earns $1 million (NPV). S&P always has the option of accommodating entry (i.e., not starting a price war). In such a case, both firms earn $4 million (NPV).

Suppose that the timing is such that NSG first has to choose whether or not to enter the market. Then S&P decides whether to “accommodate entry” or “engage in a price war.” What is the equilibrium outcome to this sequential game? (Set up a game tree.)