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Homework for Section 3

Late Work Will Not be Accepted

### Chapter 13 Monopoly

1. Consider a monopolist which has a total cost curve of:  $TC=5X+(3/2)X^2$  The market demand equation is  $X_d=245-(P/2)$ . Find the following:
  - A. P
  - B. TR
  - C. MR
  - D. AR
  - E. AC
  - F. MC
  - G. Find  $X^*$ ,  $P^*$ , and  $\pi$ .
2. Suppose that the market for CDs is monopolized by a single firm.
  - A) Draw the initial equilibrium for such a market.
  - B) Suppose now that the demand for CDs shifts outward slightly. Show that, in general (contrary to the competitive case), it will not be possible to predict the effect of this shift in demand on the market price of CDs.
  - C) Show a case where price rises and then (on a separate graph) show a case where price falls.
3. Suppose a perfectly competitive industry can produce Roman candles at a constant marginal cost of \$10 per unit. Once the industry is monopolized, marginal costs rise to \$12 per unit because \$2 per unit must be paid to lobbyists to ensure that only this firm receives a Roman candle license. Suppose the market demand for Roman candles is given by:  $X_d=1,000-50P$  and the marginal revenue curve by  $MR=20-X/25$ .
  - A) Calculate the perfectly competitive and monopoly outputs and prices.
  - B) Calculate the total loss of consumer surplus from monopolization of Roman candle production.
  - C) Graph your results. Use the same graph for both.

### Chapter 6 Choice and Uncertainty

1. Jen has narrowed her employment decision down to two choices. One job is very safe (there is no chance of getting hurt on the job), while the other job is rather dangerous (there is a 20 percent chance of being seriously injured). The safe job pays \$10,000. The risky job pays \$R. R is \$2,000 if she is injured and \$12,000 if she is not injured.
  - A) Set up a decision tree illustrating Jen's problem.
  - B) What is the expected payoff of each job?
  - C) What is the expected utility of each job if her utility function is  $U=400+X^2$ ?
  - D) Which job does she choose?
2. Suppose an investor is concerned about a business choice in which there are three prospects, whose probability and returns are given below:

<u>Probability</u>	<u>Return</u>
0.2	\$100
0.4	50
0.4	-25

What is the expected value of the uncertain investment?
3. Suppose someone offers to sell you a Michael Jordan autographed jersey for \$1,000. You think there is an 80% chance the jersey is authentic. If it is authentic, your friend who is a huge Michael Jordan fan has offered to buy the jersey from you for \$3,000. If your utility function is  $U(Y) = \sqrt{Y + 2,000}$ , what is the maximum amount you would be willing to pay a sports memorabilia expert to appraise the jersey, if the expert can tell you 100% certainly whether the jersey is authentic?

4. Suppose that you have \$10,000 to gamble at the races. A horse named Young Tasty Thang has a 90% chance of winning, but your winnings would total only 10% of your bet. An alternative horse, Old Stank, has only a 10% chance of winning, but if she does, you would gain 10 times your bet.
  - a. If you must bet all \$10,000 on one of the two horses, identify the two gambles (outcomes with payoffs and probabilities) that represent the choice you must make.
  - b. What is the expected value of each game?
  - c. Suppose your utility function is  $U(Y) = 10\ln(Y)$ . Which horse would you bet on? Why?
  - d. Which horse would you bet on if your utility function were  $U(Y) = 0.0001Y^2$ ?

### Chapter 16 Game Theory

1. Two computer firms, *A* and *B*, are planning to market network systems for office information management. Each firm can develop either a fast, high-quality system (H), or a slower, low-quality system (L). Neither firm is sure of the actions of the other. If both firms develop low-quality systems the resulting profits will be (30,30). Alternatively, if both produce high-quality systems profits are (20,20). If *A* produces (H) and *B* produces (L) payoffs would be 50 and 35, respectively. If *A* produces (L) and *B* produces (H) profits are 40 and 10, respectively.
  - A) Write out the extensive form of this game.
  - B) Does either firm have a dominant strategy?
  - C) What is the Nash Equilibrium of this game?
  - D) What are the Nash Equilibrium payoffs?
2. A firm employs a worker who likes to use drugs, and must decide whether or not to test the employee for drug use. The employee moves first. When straight, the worker is worth \$60 to the firm, but after using drugs the worker is only worth \$30 to the firm. The worker's wage is \$40. Drug testing costs the firm \$5, while staying straight costs the worker an equivalent of \$15 (The cost of paying for rehab.) Drug testing is perfectly reliable, and if the worker is caught, she gets fired, generates no revenue, and receives no wage.
  - A) Show the game Extensive form, and find the Nash Equilibrium of the game. What are the N.E. payoffs?
3. The Ewe Company and the Zee Company are the only firms in a particular market. The payoff matrix for alternative strategies for both is recorded below.

		Zee	
		Build plant on East Coast	Build plant on West Coast
Ewe	Build plant on East Coast	-50 million, -60 million	60 million, 30 million
	Build plant on West Coast	40 Million, 70 million	-30 million, -40 million

- A) Is there a Nash equilibrium?
  - B) If so, how many?
  - C) Is this a prisoners' dilemma game?
4. Consider the following matrix of two local grocery stores in a small town. They've each developed two strategies: offer double coupons or stay open 24 hours to help increase sales. Payoffs are in terms of (Firm A's percentage of sales, Firm B's percentage of sales).

		Firm B's actions	
		Double coupons	Stay open 24 hours
Firm A's actions	Double coupons	(40, 60)	(55, 45)
	Stay open 24 hours	(45, 55)	(60, 40)

- A) Does either firm have a dominant strategy? If so, what is it?
  - B) Solve for the Nash equilibrium of the game.

### Chapter 18 Externalities and Public Goods

1. Consider again the regulatory example in Figure 18.6 in your textbook.
  - A) Suppose that in the name of "fairness," David and Saul are ordered to cut their use of pesticides by the same amount- from  $X_s$  to  $X_s^*$ . How much more costly is this solution than the fully efficient policy?

- B) Suppose that David and Saul are both ordered to cut their use of pesticides to  $(X_S^* + X_D^*)/2$ . What are the efficiency costs of this regulation in comparison with the optimal policy?
2. In each of the following situations, explain whether the Coase Theorem would be likely to provide a basis for dealing with the externality.
- A) The Ganges River in India receives industrial effluents, including toxic heavy metals, from hundreds of tanneries that operate along its banks. Further, millions of gallons of raw sewage are spilled into the river from hundreds of cities, towns, and villages.
- B) Many scientists believe that global warming is caused by carbon dioxide that is released when coal, oil, and wood are burned.
- C) My neighbor owns a “bug zapper,” an electrical device that kills insects. The longer that she keeps the zapper on, the fewer the number of mosquitoes that appear in my backyard.
3. The public good  $Z$  can be provided at a constant marginal cost of \$12. Cagney’s demand for  $Z$  is  $Z = 20 - P_z$ , and Lacey’s is  $Z = 16 - 2P_z$ , where  $Z$  is the quantity demanded and  $P_z$  is the price per unit. What is the Pareto efficient level of  $Z$ ?