Homework: Game Theory   **Economics 304**

1) What differentiates game theory from single-agent problems?

2) Compare the grim trigger and tit-for-tat strategies.

3) Explain how <u>infinitely repeated games</u> might be helpful in sustaining a cooperative equilibrium in game theory.

4) What is a mixed strategy and when is it useful?

5) Two oligopolistic aluminum manufacturers are engaged in bitter competition with one another. The biggest firm, Big Aluminum Giant (BAG), is deciding whether to expand capacity or hold the line. The smallest firm, Little Aluminum Giant (LAG), is also considering expansion. The table below shows payoffs for the firms under various scenarios:

		BAG	
		Don't Expand	Expand
LAG	Don't Expand	3 , 4	2 , 3
	Expand	4 , 2	1 , 1

a. What is the Nash equilibrium outcome in this game of capacity expansion? Why? How does dominance play a role in arriving at your answer?

b. Suppose the game is <u>played sequentially</u>, with BAG moving first. What is BAG's best strategy? Does it lead to the same equilibrium you found in the simultaneous game?

6) For each player in the following games

A) Find the simultaneous move Nash Equlibrium.

B) Draw the sequential move games with Roadrunner and Maggie moving first and solve for the Nash equilibrium.

a.

		Coyote	
		Anvil	Dynamite
Roadrunner	Beep	6 , 2	4 , 5
	Run	7 , 3	6 , 8

b.

		Bart	
		Pout	Whine
Maggie	Lay Finger on Butterfinger	6 , 8	11 , 3
	Ignore Butterfinger	2 , 6	9 , 5

7) In the 1960s, tobacco producers engaged in fierce battles for market share. The major weapon in that war was advertising — advertising that was designed not to attract new smokers, but to lure smokers away from competing brands. Consider the following scenario: There are two tobacco sellers, Phillip and R. J., each of whom can choose to advertise on TV (at a cost of $20 million) or not. There are $100 million of pre-advertising profits available to the two firms. If they both adopt the same budget, they will split the market evenly. If one chooses a high budget while the other chooses low, the high-budget firm will steal half the other's customers and capture $75 million of pre-advertising profit; the other will earn $25 million. The firms' net profits (after advertising expenses are considered) are illustrated in the payoff matrix below:

		R. J.	
		Advertise	Don't Advertise
Phillip	Advertise	$30 , $30	$55 , $25
	Don't Advertise	$25 , $55	$50 , $50

a. Verify that the payoffs in the table reflect the story told above.

b. What is the Nash equilibrium in this game? Is the equilibrium outcome a good one for anybody?

c. Suppose that Phillip and R. J. promise one another that they will not advertise. Is such a promise credible? Explain.

d. In 1971 the federal government banned cigarette advertising on TV. Initially, tobacco companies protested vehemently. Referring to the game table above, discuss whether Big Tobacco's protests were genuine.

8) At a time when demand for ready-to-eat cereal was stagnant, a spokesperson for the cereal maker Kellogg's was quoted as saying, " . . . for the past several years, our individual company growth has come out of the other fellow's hide." Kellogg's has been producing cereal since 1906 and continues to implement strategies that make it a leader in the cereal industry. Suppose that when Kellogg's and its largest rival advertise, each company earns $0 billion in profits. When neither company advertises, each company earns profits of $7 billion.

If one company advertises and the other does not, the company that advertises earns $52 billion and the company that does not advertise loses $2 billion. For what range of interest rates could these firms use trigger strategies to support the collusive level of advertising? Show your work.

9) You manage a company that competes in an industry that is comprised of five equal-sized firms. A recent industry report indicates that a tariff on foreign imports would boost industry profits by $30 million—and that it would only take $5 million in expenditures on (legal) lobbying activities to induce Congress to implement such a tariff.

Discuss your strategy for improving your company's profits.

10) While there is a degree of differentiation between major grocery chains like Albertsons and Kroger, the regular offering of sale prices by both firms for many of their products provides evidence that these firms engage in price competition. For markets where Albertsons and Kroger are the dominant grocers, this suggests that these two stores simultaneously announce one of two prices for a given product: a regular price or a sale price. Suppose that when one firm announces the sale price and the other announces the regular price for a particular product, the firm announcing the sale price attracts 1,000 extra customers to earn a profit of $5,000, compared to the $3,000 earned by the firm announcing the regular price. When both firms announce the sale price, the two firms split the market equally (each getting an extra 500 customers) to earn profits of $2,000 each. When both firms announce the regular price, each company attracts only its 1,500 loyal customers and the firms each earn $4,500 in profits.

If you were in charge of pricing at one of these firms, would you have a clear-cut pricing strategy? If so, explain why. If not, explain why not and propose a mechanism that might solve your dilemma. (*Hint*: Unlike Walmart, neither of these two firms guarantees "Everyday low prices.")