Intermediate Microeconomics
ECON 340
Problem Set 6

Due on Thursday April 28th at the beginning of class

You must show how you arrived at every single answer on the problem set. You will receive ZERO credit for any answer where you don't show your work.

1. (10 pts) Suppose Sony and Apple are the first companies to introduce to the market 'smart' Blu-ray players to both play discs and stream movies from cloud-based apps like Netflix. Studies by the firms suggest that consumers who purchase consumer electronics are very brand-loyal. To capture future loyalties, each firm will attempt to maximize its initial market share, for one time only, by setting prices simultaneously. An economist has estimated the profits (in millions) of each firm under different pricing scenarios. Her results are captured in the following payoff matrix.

Apple

	Price	Low	Medium	High
Sony	Low	750 250	800 200	1000 0
	Medium	700 300	750 350	800 200
	High	600 400	700 300	750 250

   a. (5 pts) Identify the best responses of each firm. Are there any Dominant Strategies? Are there any Dominated Strategies?
   b. (5 pts) Identify the Nash Equilibrium strategies and outcomes of the game? Is there a Dominant Strategy Equilibrium? Explain.

2. (20 pts) The NCAA prohibits schools that are caught paying athletes from participating in bowl games, and sometimes the punishment is more severe. To understand why schools don't break away from the NCAA and form a league in which athletes can legitimately be paid, let's analyze the following normal-form game:
   Assume there are only two schools (A and B). If both schools pay athletes, then athletes extract virtually all of the profits, and each school is left with only $1 million in profits. If both schools don't pay athletes, each school earns $7 millions in profits, since less money goes to the athletes. If one school pays athletes and the other school does not, the school that pays athletes earns profits of $15 million and the school that does not pay athletes loses $15 million.
   a. (5 pts) Write the normal form representation of this game
   b. (5 pts) Find the Nash equilibrium for a one-shot version of this game. Find the Nash equilibrium if this game is repeated 5000 times.
   c. (5 pts) Now suppose the game is infinitely repeated. Describe the Grim trigger strategies that the schools can use to sustain the outcome with the highest aggregate payoff (the collusive outcome).
   d. (5 pts) For what values of the interest rate can collusion be sustained?

3. (10 pts) Consider the following two-player, sequential-move game. There are only two gas stations near the Purdue campus, **Smart Shop** and **Speedway**. Smart Shop is thinking of implementing a third degree price discrimination scheme by giving Purdue students a special discount. Speedway must decide whether to offer student discounts as well. If both firms decide to *offer student discounts*, each expects profits to be $75k per week. If both firms decide *not to offer student discounts*, each expects profits to be $50k per week. However, if one firm offers students discounts and the other does not, the firm that offers the discounts will earn $100k per week and the other firm profits will be $40k per week

   a. (3pts) Show the extensive form of this game assuming Smart Shop moves first.
   b. (3pts) Identify, graphically, the Nash Equilibrium outcomes
   c. (2pts) Find the Sub game Perfect Nash Equilibrium outcomes
   d. (2pts) What would be the Sub game Perfect Nash Equilibrium outcomes if Speedway moves first? Explain

4. (10 pts) You are considering entering a market serviced by a monopolist. You currently earn $0 economic profits, while the monopolist earns $15. If you enter the market and the monopolist engages in a price war, you will lose $10 and the monopolist will earn $8. If the monopolist doesn't engage in a price war, you will each earn profits of $10.

   a. (5pts) Write out the extensive form of the above game.
   b. (3pts) There are two Nash equilibria for the game. What are they?
   c. (2pts) Is there a subgame perfect equilibrium? Explain.

5. (15 pts). You are a temporary worker considering two job opportunities. Job Offer 1 pays a salary of $63 that day for sure. Job Offer 2 pays a base salary of $25, but offers the possibility of a $56 bonus *on top of your base salary*. You believe that there is a 0.70 probability that you will earn the bonus. You have a utility function given by $U = X^{1/2}$

   a. (4 pts) What is the expected salary under each offer? What is the variance of the salary under each offer?
   b. (4 pts) Compute the expected utility of each offer. Which job offer would you accept?
   c. (2 pts) Based on your answer to (a) and (b), are you risk averse, risk loving, or risk neutral? Explain.
   d. (5 pts) What salary in Job Offer 1 would make you indifferent between the two Job offers? Explain. Interpret the difference between your answer and the current salary in job offer 1.

6. (10 pts) Identify if an individual with the following utility functions is risk averse, risk loving, or risk neutral. Clearly explain why.
   a. (2 pts) $U(x)= 2x +5$
   b. (2 pts) $U(x)= X^3$
   c. (2 pts) $U(x)= -0.5e^{-2x}$
   d. (2 pts) $U(x)= -x^{-2}$ where $x>0$
   e. (2 pts) $U(x) = 2x + 10x^{1/2}$

7. (25 pts) Suppose that the market is comprised of 4 groups of people of differing risk categories. Individuals know their own risk, ***but insurers cannot tell which group a person belongs to.*** Each individuals has a current income equal to $40,000 and faces a risk of requiring **medical treatment costing $7,600.**
   Each individual has an utility function given by $\boldsymbol{U = X^{1/2}}$
   Each group's probability of requiring medical treatment is as follows:

Group	1	2	3	4
# of People	1,000	1,000	1,000	1,000
Probability of Medical Treatment	0.20	0.40	0.60	0.80

   a. (5 pts) What is the most money each group will be willing to pay for an insurance policy that fully insures them in the event they require medical treatment (risk premium)?

   b. (4 pts) What is the expected loss for each group? How does it compare to their maximum willingness to pay for insurance? Why are these different?

   c. (4 pts) What is the average riskiness of a person seeking insurance?
   If an insurance company were to charge all its clients the same premium to fully insure them, what would the **fair premium** be?
   Which group(s) would buy insurance at this price? Why?

   d. (4 pts) What is the average riskiness of the persons now seeking insurance? (the group(s) identified in the last part of question (c) above).
   What would be the new fair premium that the insurance company would charge all its clients?
   Which group(s) would buy insurance at this price? Why?

   e. (4 pts) What is the average riskiness of the persons now seeking insurance? (the group(s) identified in the last part of question (d) above).
   What would be the new fair premium that the insurance company would charge all its clients?
   Which group(s) would buy insurance at this price? Why?

   f. (4 pts) Is this an efficient outcome? Explain.
   Describe the different options the firm has to address this problem.