ECN 453: Game Theory Practice Questions

1 The discrete Bertrand game (p186)

- **Question**: Two firms set prices simultaneously. Consumers buy from the firm with the lowest price and split their demand equally across the two firms if prices are equal. Market demand is $q = 10 - p$, $MC = 2$. Sellers can only set the following prices: $3, 4, 5$.
- 1. Write down the normal form game.
- 2. Solve for the equilibrium of the game.

2 Ex. 7.7 HDTV Standards

- **Question:** US and Japan simultaneously decide whether to invest a high or low value into HDTV research. If both countries choose 'low' payoffs are (4,3) for the US and Japan respectively. If US chooses low level and Japan a high level, payoffs are (2,4). If US chooses high level and Japan low, payoffs are (3,2). If both countries chooses a high level, payoffs are (1,1).
- 1. Are there any dominant strategies in this game? What is the Nash equilibrium? What are the implicit rationality assumptions?
- 2. Suppose the US now has the option of committing to a strategy ahead of Japan. How would you model this situation? What are the subgame-perfect Nash equilbria of this game?
- 3. Comparing your answers to 1. and 2., what can you say about the value of commitment for the US?

3 Price match guarantee in the market for luxury cars

- Two firms are competing on prices. Each firm can choose to set a high price p_H or a low price p_L, where $p_H > p_L$. Profits are given by:

		Firm 2: p_H	Firm 2: p_L
Firm 1: p_H		100, 100	120, 0
Firm 1: p_L		0, 120	70, 70

1. Draw the extensive form if firm 1 moves first. Solve for the subgame perfect equilibrium.
2. Suppose firm 1 offers consumers to match its price with the lowest price in the market. Solve for the SPE of the modified game (Hint: modify the game to three stages, allowing firm 1 to make a move in the third stage only in the case where it chose p_H in the first stage and firm 2 chose p_L in the second stage.)

4 Question from practice exam

Consider the following game (where 'x' stands for a number).

		Player 2: L	Player 2: R
Player 1: T		50, 0	50 - x, 0
Player 1: B		20, 10	-20, -20

1. Assume that $x = 0$. What are all the Nash equilibria?
2. Provide a value of x where (B,L) is the *unique* Nash equilibrium?
3. Assume that $x = 0$ and that the players play (B,L) in the simultaneous game. How much would player 2 pay to commit to moving first? (Hint: it might be helpful to write out the sequential game.)
4. Assume that player 2 moves first. Provide a value of x to ensure that (B, L) is the unique subgame-perfect equilibrium.