PUAF 8216 Microeconomics Section 3
Lab Summary 6
13 October 2000

1. "Hershey's Kisses" Game. Saroya and Rocio volunteered to play the "Hershey's Kisses" game wherein they could either play a red card or a blue card with the following payoffs:

I play	she plays	I get
Red	Blue	4
Blue	Blue	3
Red	Red	2
Blue	Red	1

Each player started with 4 Kisses, and the aim of the game was to accumulate as many Kisses for herself as possible. We translated the payoff structure into a matrix that resembled the Prisoner's Dilemma, wherein more is better:

Payoffs are: (Saroya, Rocio)		Rocio: Red	Rocio: Blue
Saroya	Red	(2,2)	(4,1)
	Blue	(1,4)	(3,3)

During the course of the game, we observed three outcomes emerging under different conditions:

- Red/Red. For the first few rounds of the game, I did not allow Saroya and Rocio to communicate with each other. Since each of them did not know how the other was going to play the game, then they each had a *Strictly Dominant Strategy* to play Red.

- Blue/Blue. After I allowed Saroya and Rocio to communicate and collaborate, they both started playing Blue repeatedly, which yielded the best aggregate outcome in repeated games.

- Blue/Red. (*Optional material*) At one point, I told both Saroya and Rocio that the next round was going to be the last round for the entire game. Knowing that she did not need to cooperate with Saroya after the last round, Rocio decided that it was in her best interest to maximize her payoff by following her strictly dominant strategy and playing Red. Rocio's endgame decision to play her strictly dominant strategy caught Saroya by surprise, and Rocio was rewarded with 4 Kisses while Saroya got only 1 (also known as the *sucker's payoff*). This phenomenon is known as the "n–1 dilemma". That is to say, any player who anticipates that a series of game will end in round n, will inevitably anticipate that the opponent will play his strictly dominant strategy in round n. In order to pre-empt the opponent, the player will rationally maximize his payoffs by playing his strictly dominant strategy in round n–1. However, since both players are perfectly rational and have perfect information, then they will each pre-empt each other all the way backward until round 1, and this phenomenon eliminates any prospects of co-operative behavior.

Important outcomes:

- Nash equilibrium. Also known as a mutually compatible outcome, the Nash equilibrium is a result wherein, given that outcome neither player has any incentive to change his strategy. To decide if an outcome is Nash equilibrium, we have to inspect all the cells in the same row and same column as the original cell to check if, holding his opponent's strategy constant, either player's payoff can be improved by switching strategy. If neither is possible, then that outcome is Nash equilibrium. In the "Kisses" game, only Red/Red satisfied the conditions of Nash equilibrium.

- Pareto optimal. An outcome is Pareto optimal if it is impossible to pick any other outcome (does not have to be in the same row or column) that makes at least one of the players better off without making any of the rest worse off. In the "Kisses" game, Blue/Red, Red/Blue and Blue/Blue were all Pareto optimal.

2. Unconstrained Maximization. We will generally face two types of unconstrained maximization problems:

- Maximize revenue, $R = PQ$. In this case, we know that Q may be expressed as some function of P. After substituting the value of Q, we may express R in terms of P only. Subsequently, we may apply the first and second order conditions to find the revenue-maximizing price and quantity (see lab summary 4 number 2).

- Maximize utility of consumption and leisure, $U = \mathrm{F}(C,L)$. Again, we know that C may be expressed as some function of L. Often, it is $C = w(16–L)$. After substituting the value of C, we may express U in terms of L only. Subsequently, we may apply the first and second order conditions to find the utility-maximizing quantity of leisure and consumption.