CIS112 Problem Set #2

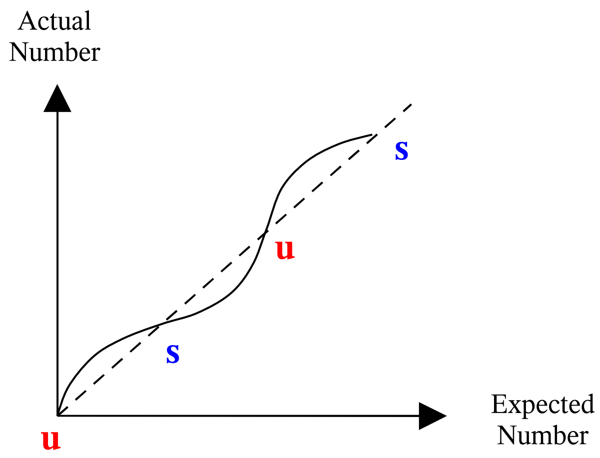
1) (15 points) Describe a real-world "market for lemons," preferably not one discussed in class or by Schelling. What are the specific properties that make it a market for lemons and what effect do they have on the market's dynamics? What mechanisms could be put in place to change these dynamics? In your answer, be sure to discuss information asymmetry and how it applies to the market you've chosen.

   The "all you can eat" buffet is a nice example. Because restaurants offering such buffets are unsure as to which patrons will eat a lot or a little, they must charge a price large enough to cover the average amount of food consumed. For customers with modest appetites, this price will be too high and only the customers with larger appetites will be willing to pay. However, since the average amount of food consumed by this group is even larger, the restaurants must charge an even higher price for their buffets. The relatively modest eaters for this group will leave and the price will go even higher. Eventually, only the hungriest, most insatiable diners will be left, a population not large enough to sustain the restaurants. The information asymmetry here is that customers have more knowledge about their own appetites than the restaurants do. The fix is to charge each customer for the amount he consumes, and this is probably why all-you-can-eat is the exception in commercial dining.

2) (15 points) As evidenced by many examples in Schelling's book, innocent individual preferences can lead to globally undesirable outcomes, for example, traffic jams resulting from rubbernecking, sub-optimal seating arrangements and self-segregated housing. Give an example not mentioned in class or by Schelling in which individuals' preferences and choices lead to a globally undesirable outcome. Additionally, what mechanisms prevent people from changing or escaping this outcome?

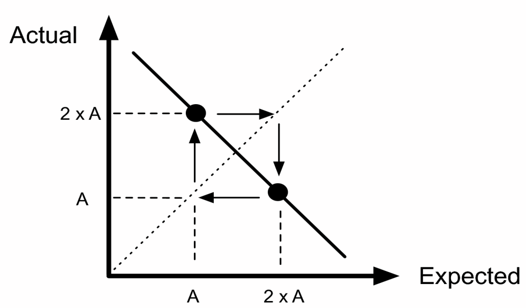
   The following is a simplification of a not so uncommon urban phenomenon: Artists relocate to a depressed area seeking cheap studio and living space. Their presence, however, attracts related bohemian groups such as bike messengers and students. Soon after, the neighborhood starts to appeal to young, upwardly-mobile individuals who now are followed by restaurants and coffee shops. At this point the neighborhood becomes too expensive for the artists who moved there in the first place and they are forced to relocate again. One hypothesis as to why the artists cannot "escape" is that they share sociological traits with the group of people who dislocate them. That is, their presence in a neighborhood makes it amenable to the more affluent groups whose influx drives them out.

3) Part-A (10 points) On the figure below, list all points which are stable equilibria and all points which are unstable equilibria.



From left to right, the equilibria alternate between unstable (red) and stable (blue) This can be seen by picking a point on the x-axis near one of the equilibria, going vertically up to the curve, then going horizontally to the 45-degree line, and then going vertically back to the curve. Iterating this process near a stable equilibrium point will pull one towards the equilibrium, while executing it near an unstable equilibrium will push one away.

Part-B (10 points) Consider the following rule that a person might use for deciding whether to go to the beach: If the person expects many people to be at the beach then the person will choose to stay home, and conversely, if the person expects few people to be at the beach, the person will go to the beach. Draw a figure like that in part "A" which shows that if everybody adopts this rule, the system can oscillate indefinitely (never reach an equilibrium) such that on alternate days, there are few/many people at the beach.



Drawing a line through the 45-degree line with a slope of between negative 45 and negative 90 degrees does the trick. In the figure above, a negative 45 degree line has been drawn so that if "A" people are expected to attend the beach, "2*A" people will actually attend. The following weekend, "2*A" people will be expected to attend so "A" people will actually attend. On the 3rd week, "A" people will again be expected to attend again and the cycle will repeat itself.

4) (20 points) Consider a game in which two players, a "Row" player and a "Column" player, each have three pure strategies available. Row's strategies consist of "top", "middle" and "bottom," and Column's strategies consist of "left", "center" and "right." The game can be described by a 3x3 table whose cells are of the form (i, j) where i is the payoff to the Row player and j is the payoff to the Column player. For example in Game 1 (below), when the Row player plays Top and Column player plays Center, the payoff to Row player is 3 and the payoff to Column player is 2.

	Left	Center	Right
Top	(1,2)	(3,2)	(2,1)
Middle	(2,2)	(1,1)	(6,1)
Bottom	(0,7)	(2,2)	(5,7)

Game 1

	Left	Center	Right
Top	(1,6)	(1,7)	(2,1)
Middle	(2,1)	(3,2)	(6,1)
Bottom	(0,4)	(4,3)	(5,7)

Game 2

Find all pure strategy Nash equilibria for games 1 and 2 and justify your answers.

In game 1, cells *(top, center)* and *(middle, left)* are equilibria since neither Row nor Column can increase his payoff by unilaterally changing strategies. In game 2, every cell provides such an opportunity so the game has no pure strategy equilibrium.

5) (15 points) Give three reasons why Nash equilibria are of only limited use in understanding how real people behave in game-theoretic scenarios. What short-coming(s) of classical game theory does behavioral game theory try to address?

There are many reasons. Among them:
- Knowing that certain equilibria exist tells us nothing about how people learn to play them or choose between them.
- Related, computing Nash equilibria is a difficult computational problem, making it unlikely that human players can actually compute them. Additionally, the difficultly of computation makes Nash equilibria less useful for academics and scientists who are also unable to compute them with advanced techniques.
- The notion of equilibria we have studied requires that players act unilaterally. However, players often act cooperatively, making the theory less useful.

6) (10 pts) Consider the distributed graph coloring game discussed in lecture. How might players change their strategies if the payoff structure was altered so that people were payed in proportion to the number of neighbors with different colors? Do you think this alternative payoff structure would make it easier or harder for players to find a proper coloring of the graph?

Students interpreted this question in two different ways and answers for both were accepted. Under the first interpretation, a player was payed in proportion to the number of neighbors who had a different color from him. Under the second, a player was payed in proportion to the number of different colors found in their immediate neighborhood.

In the first scenario, players would be likely to choose the least used color in their neighborhood since this would yield a better payoff. One possibility is that this would make it easier for players to color the graph since they would be more likely to use the full range of available colors. Another is that this would make it harder, since players receiving payoffs that they felt were "large enough" would be more reluctant to switch colors should the state of the network coloring converge to a local minimum. Of course, network structure greatly affects which of the possibilities are realized.

In the second scenario, a player could try to coerce his neighbors into adopting a wider range of colors by switching his own colors to that of the most used color in his neighborhood. Such a strategy would most likely make it more difficult to reach a solution since it would cause a great deal of instability in the coloring process. However, it could also make it easier if it incented players to explore a larger space of colorings in a short amount of time.