Assignment 4: Game Theory

Due May 29th, 2018

Question 1: Utility/Payoff functions

1A

Person 1 cares both about her income and about person 2's income. Precisely, the value she attaches to each unit of her own income is the same as the value she attaches to any two units of person 2's income.

- How do her preferences order the outcomes (1, 4), (2, 1), and (3, 0), where the first component in each case is person 1?s income and the second component is person 2's income? Give a payoff/utility function consistent with these preferences.

1B

An agent's preferences over the set A = {a, b, c} are represented by the payoff/utility function u for which $u(a) = 0$, $u(b) = 1$, and $u(c) = 4$.

- Are they also represented by the function v for which $v(a) = -1$, $v(b) = 0$, and $v(c) = 2$?
- How about the function w for which $w(a) = w(b) = 0$ and $w(c) = 8$?

Question 2: Nash Equilibria

2A

Here is the *Bach or Stravinsky* game we saw in class.

(1) Two people wish to go out together. Two concerts are available: one of music by Bach, and one of music by Stravinsky. One person prefers Bach and the other prefers Stravinsky. If they go to different concerts, each of them is equally unhappy listening to the music of either composer.

Here is a model of the game:

	Bach	Stravinksy
Bach	2, 1	0, 0
Stravinsky	0, 0	1, 2

Table 1: Bach or Stravinsky

- Are there any Nash equilibria for this game?
- If so, what are they?

Justify your answer.

2B

(2) **Matching pennies game.**
Two people choose, simultaneously, whether to show the Head or the Tail of a coin. If they show the same side, person 2 pays person 1 a dollar; if they show different sides, person 1 pays person 2 a dollar. Each person cares only about the amount of money she receives, and (naturally!) prefers to receive more than less.

- Build a model for the matching pennies game (like in Table 1).
- Are there any Nash equilibria for this game?
- If so, what are they?

Justify your answer.

2C

(3) **The Stag Hunt**
Each of a group of hunters has two options: she may remain attentive to the pursuit of a stag, or catch a hare. If all hunters pursue the stag, they catch it and share it equally; if any hunter devotes her energy to catching a hare, the stag escapes, and the hare belongs to the defecting hunter alone. Each hunter prefers a share of the stag to a hare.

- Build a model for the stag hunt (like in Table 1).
- Are there any Nash equilibria for this game?
- If so, what are they?

Justify your answer.