PS/Ec 172, Set 2
Due Friday, April 16th

Collaboration on homework is encouraged, but individually written solutions are required. Also, please name all collaborators and sources of information on each assignment; any such named source may be used.

(1) Subgame perfect equilibria.
   (a) 10 points. Find a subgame perfect equilibrium of the dollar auction extensive form game, as described in section 2.9 of the lecture notes.

   (b) 20 points. Consider a finite extensive form game with perfect information in which every terminal history is associated with a different outcome, and where no player is ever indifferent between two outcomes. Explain why such a game has a unique subgame perfect equilibrium.

(2) Equilibria in strategic form games. Find all the equilibria in the following games, which are described in the lecture notes.
   (a) 5 points. Prisoner’s dilemma.

   (b) 5 points. Stag hunt.

   (c) 5 points. Bertrand competition with \( n \geq 10 \) companies.

   (d) 5 points. Public goods.

   (e) 10 points. Voter turnout when \( N^a \) and \( N^b \) are the same size.

   (f) 10 points. Voter turnout when \( N^a \) is larger than \( N^b \).

(3) Cournot competition. The Cournot competition game is described in the lecture notes.
   (a) 15 points. Find a symmetric pure Nash equilibrium of the Cournot competition game, as described in Exercise 3.9 of the lecture notes.

(4) Intransitive dice. A die has six sides, each labeled with a number. Consider three dice that are labeled as follows
   (a) 2, 2, 4, 4, 9, 9.
   (b) 1, 1, 6, 6, 8, 8.
   (c) 3, 3, 5, 5, 7, 7.

Players 1 and 2 play the following extensive form game with perfect information. First, player 1 picks one of these three dice. Then player 2 picks one of the two that are left over. The utility of a player is the probability, when the two picked dice are rolled, that their die shows the higher number.

   (a) 10 points. Find a subgame perfect equilibrium of this game.

Omer Tamuz. Email: tamuz@caltech.edu.
(b) 4 points. Who has the higher utility? Is there a subgame perfect equilibrium in which the other player has higher utility?

(c) 1 point. Read this: https://en.wikipedia.org/wiki/Intransitive_dice#Warren_Buffett.