

Problem set 1

These exercises are recommended to help you understand the material better. This is a non-credit course, so your solutions will not be graded. However, we will be happy to look at and go over your solutions if you bring them to our office hours.

1. Consider a 2-player $m \times m$ game (i.e. both players have m strategies), where the payoffs to each player at each of the m^2 strategy profiles are drawn independently from the uniform distribution on $[0, 1]$. Compute the probability that there is no pure Nash equilibrium in such a game as m goes to infinity.
2. Show that the price of anarchy in the global network connection game from lecture 1 is indeed upper bounded by k , the number of players, no matter what the underlying graph. (The matching lower bound was given in lecture).
3. Consider the selfish source routing model defined in lecture 2 (atomic players, identical traffic requirements, affine congestion functions):
 - (a) Tighten the upper bound on the Price of Anarchy to $5/2$.
 - (b) Show that this bound is tight by finding a network configuration that gives a $5/2$ Price of Anarchy.