

Economics Game Theory 617: Assignment 1

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Note: All solutions must be emailed to me (lones@umich.edu). The subject header must be included as **617 asmt**. This means they are either typeset in L^AT_EX, Word, etc, or well enough hand-written that they can be scanned into pdf or other common form, and emailed to me. Please do not email me (1) more than 4 pages, and (2) files of size more than 200K. Please be rigorous.

1. A Hider and a Seeker play an evasion game in a unit radius disk $\{(x, y) : x^2 + y^2 \leq 1\}$. That is, this is the common pure strategy space for both players. The Seeker finds the Hider (payoff 1 for the Seeker, 0 for the Hider) if he chooses a point weakly within Euclidean distance $1/2$ of the Hider's location. Otherwise, the Hider escapes, and the payoffs are 0 for the Seeker, 1 for the Hider. Find the value of this game for the Seeker, and the Nash equilibrium strategies which support this value. [5]

Hint: Consider the one-dimensional analogue: What would happen if the disk were a line interval of length 1, and the seeker could lay down a line of length 1?

2. R and C play a 2×5 game (2 pure strategies for R, and 5 for C). Prove that the value of this game is the same as the value of a 2×2 game formed by excising pure strategies for C. [2]

3. A new casino game called "Jackblack" is invented. It is played with an infinite deck of cards, that each have on them a real number uniformly and independently drawn from $[1, 3]$. The House sequentially deals cards *face down* to the Player. The Player takes as many cards as he wishes, up to 3. The House (knowing only how many cards were dealt to the Player) then deals its own cards face up, stopping when it wishes. The winner is the individual who gets as close to 3 without going over ('bust'). The House wins if both bust, or if both tie. [3]

What are the odds of this game for the House against the smartest Player? What should that Player do? What is the House rule for stopping?