UNIVERSITY OF CALIFORNIA, BERKELEY

DEPARTMENT OF STATISTICS

STAT-155: Game Theory

Fall 2013

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Assignment # 10

Date Given: November 18, 2013 (Monday) **Total Points: 20**
Date Due: November 25, 2013 (Monday)

1. Consider the two examples done in class on two-person zero-sum games with infinite strategy spaces. The games were as follows:

   Two players I and II are going to call two numbers simultaneously from the set of positive integers $\mathbb{N} := \{1, 2, 3, \cdots\}$. The payoff matrices are given by

$$A(i,j) = \begin{cases} +1 & \text{if } i > j \\ 0 & \text{if } i = j \\ -1 & \text{if } i < j \end{cases}$$

   and

$$B(i,j) = \begin{cases} 4^j & \text{if } i > j \\ 0 & \text{if } i = j \\ -4^i & \text{if } i < j \end{cases}$$

   where $1 \leq i < \infty$ and $1 \leq j < \infty$.

   (a) Show that for the first example, that is the game with payoff matrix A, the expected gain of Player I, when Player I plays a mixed strategy $\mathbf{x}$ and Player II plays a mixed strategy $\mathbf{y}$, is always defined.

   (b) Show that by an example that above may not hold for the second example, which is the game with payoff matrix B.

2. Consider a finite two-person general sum game $(\mathbf{X}, \mathbf{Y}; (A_{m\times n}, B_{m\times n}))$. Suppose (i^*, j^*) be a *saddle point* for the two matrices A and $-B$ where $1 \leq i^* \leq m$ and $1 \leq j^* \leq n$.

   Find a pair of safety strategies for Players I and II. Do you think your answer is also a *Nash equilibrium*?