ECON 7011, Semester 110.1, Assignment 1

Please hand in your solutions via NTU Cool before 11:59pm on Tuesday, November 23

1. In this problem, we will show that the restriction to pure strategies in part 2 of Definition 1.2 comes at no loss of generality.

   (a) Suppose that pure strategy s_i strictly dominates every other pure strategy s_i'. Show that it also strictly dominates every mixed strategy $\sigma_i \in \Delta(\mathcal{S}_i) \setminus \{\delta_{s_i}\}$.

   (b) Show that a mixed strategy σ_i with $\operatorname{supp} \sigma_i = \{s_i^1, s_i^2\}$ cannot be strictly dominant.

2. In this counterexample, we will see that the set of strategies that survive IESDS is in general strictly larger than the set of all rationalizable strategies. Consider the 3-player game, in which Player 3's payoffs are given as follows:

	L	R			L	R			L	R
T	3	0		T	2	−4		T	0	0
D	0	0		D	−4	2		D	0	3
	A				B				C	

   (a) Show that Player 3's strategy B is not strictly dominated.

   (b) Show that strategy B is not a best response to any mixed strategy profile σ_{-3} of players 1 and 2 and, hence, not a best response to any conjecture.

   (c) Explain how the payoffs of Player 1 and Player 2 have to be chosen such that $\mathcal{R}_3^\infty \neq \Sigma_3^\infty$.

3. Two political rivals can choose to buy time on TV to run negative ad campaigns against their opponent. Suppose that government regulations stipulate that no more than 2 hours of negative campaign time can be bought by either campaign so that $a_i \in [0, 2]$. Suppose that each player i's utility function is $u_i(a) = a_i(1 + a_{-i} - a_i) - 2a_{-i}$.

   (a) Find the set of all rationalizable strategies in this game.

   (b) Common knowledge of rationality is a sufficient assumption to arrive at the prediction in (a). Is it also necessary?