1 Problem Set 6 (for January 26)

- Consider the following three player game Γ:

	C_2 and C_3			
	x_3		y_3	
C_1	x_2	y_2	x_2	y_2
x_1	$0,0,0$	$6,5,4$	$4,6,5$	$0,0,0$
y_1	$5,4,6$	$0,0,0$	$0,0,0$	$0,0,0$

  (a) Extend the definition of bi-matrix games to three-matrix games and transform Γ accordingly

  (b) Find all equilibria of Γ. $(*)$

- Consider a two-player game given in matrix form where each player has n strategies. Asume that the payoffs for each player are in the range $[0, 1]$ and are selected independently and uniformly at random. Show that the probability this this random game as a pure Nash equilibrium approaches $1 - \frac{1}{e}$ as n goes to infinty.

  Hint: Recall that $\lim_{n\to\infty}(1 - \frac{1}{n})^n = \frac{1}{e}$.

- Recall two-person zero-sum games, together with the min-max theorem we considered for these games. Consider a three-person zero-sum game, i.e., a game in which the rewards of the three players always sums to zero. Show that finding a Nash equilibrium in such games is as least as hard as in general two-person games. $(*)$

- Prove that the support enumeration algorithm leads to unique solutions of the considered linear equations, iff the (two-player) game is non-degenerated. $(*)$

- Show that in an equilibrium of a non-degenerated game, all pure best responses are played with positive probability.