Problem Set 1

1. Two individuals must decide simultaneously how much to contribute to a public good. Each individual has wealth $w_i > 0.25$ and must choose to contribute a sum c_i, where $c_i \in [0, w_i]$. The total amount of public good, y, is given by:

$$y = \sqrt{c_1 + c_2}.$$

The utility of individual i is given by:

$$u_i = y + w_i - c_i.$$

Find all the (pure strategy) Nash equilibria of the game.

2. Consider a road which is represented by the interval $[0, 1]$. There are two vendors who must simultaneously decide the exact location for their shops within the interval $[0, 1]$. A unit mass of identical consumers is uniformly distributed on $[0, 1]$, and each consumer buys from the vendor who is located closer. If both vendors locate at the same point a, then each vendor gets one-half of the consumers.

a) Write down the strategy sets and payoff functions of the game.

b) Find the Nash equilibria in pure strategies.

3. Three players $i = 1, 2, 3$ are involved in a joint project. Each player chooses simultaneously the effort level $e_i \in [0, 2]$ which to contribute to the project. The output of the joint project is given by: $y = 6e_1e_2e_3$. Players divide this output equally among them. Each player's effort costs are: e_i^2. A player's payoff equals his output share net of effort cost.

a) Show that $e_1 = e_2 = e_3 = 0$ is a Nash equilibrium of this game.

b) Are there other symmetric Nash equilibria in this game?

4. **Compliance/Inspection Game:** Suppose a tax inspection agency is pondering whether or not to audit some company for tax evasion. Inspecting is obviously costly – it entails both non-pecuniary and pecuniary costs. However, tax evasion is also undesirable from the agency point of view. The payoff for the inspection game is stated in the table below. Explain intuitively why there is not NE in pure strategies. Find the NE in mixed strategies.

	Comply	Cheat
Don't inspect	0 , 0	-10 , 10
Inspect	-1 , 0	-6 , -90

5. Solve exercise 8.D.4 in Mas-Colell, Whinston and Green.

6. Solve exercise 8.D.6 in Mas-Colell, Whinston and Green.

7. Solve exercise 36.1 (*Guessing Right*) in Osborne and Rubinstein.