Homework 1

1. Consider the following game. There are two players, Mr. A and Mr. B. The two players are separated and cannot communicate. They are supposed to meet in New York City at noon for lunch but have forgotten to specify where. Each must decide where to go (each can make only one choice). If they meet each other, they get to enjoy each other's company. They each attach a monetary value of 100 dollars to the other's company (their payoffs are each 100 dollars if they meet, 0 if they do not). Suppose there are two meeting places: Grand Central Station and the Empire State Building. Draw a normal form representation for the game.

2. Draw a normal form representation of rock, paper, scissors. Assume that the winning player has to play the losing player 1 dollar.

3. In a game where player i has N information sets indexed $n = 1, ..., N$ and M_n possible actions at information set n, how many strategies does player i have?

4. There are N firms in an industry. Each can try to convince Congress to give the industry a subsidy. Let h_i denote the number of hours of effort put in by firm i, and let $c_i(h_i) = w_i h_i^2$ denote the cost of effort, with w_i a positive constant. When the effort levels are $(h_1, ..., h_N)$, the value of a subsidy for each firm is $\alpha \sum_i h_i + \beta(\prod_i h_i)$, where $\alpha > 0$ and $\beta > 0$ are constants. There are no other benefits to effort. Consider a game in which the firms decide simultaneously and independently how many hours they will each devote to this effort. Show that each firm has a strictly dominant strategy **if and only** if $\beta = 0$. What is firm i's strictly dominant strategy when this is so?