EconS 424- Strategy and Game Theory
Homework #2 - Due date: Friday, February 26th.

1. **Exercises from Harrington's textbook:**

   (a) Chapter 4: exercises 1 and 9; and

   (b) Chapter 5: exercises 5, 6 and 11.

2. There are three identical firms in the industry. The inverse demand function is $p(Q) = 1 - Q$, where $Q = q_1 + q_2 + q_3$ denotes aggregate output. To facilitate your calculations, assume that the marginal cost for all firms is zero, $c = 0$.

   (a) Find the best response function for each firm. Interpret.

   (b) Compute the Cournot equilibrium.

   (c) Show that if two of the three firms merge (transforming the industry into a duopoly), the profit of these two firms decreases. Explain.

   (d) What happens if all three firms merge?

3. Consider a game with N players. Simultaneously and independenly, the players choose between X and Y. That is, the strategy space for each playeri is $Si = \{X, Y\}$. The payoff each player who selects X is

$$2m_x - m_x^2 + 3$$

   where m_x is the number of players who choose X. The payoff each player who selects Y is

$$4 - m_y$$

   where m_y is the number of players who choose Y. Note that $m_x + m_y = N$.

   (a) For the case of only two players, $N = 2$, represent this game in the normal form, and find the pure-strategy Nash equilibria (if any).

   (b) Suppose now that $N = 3$. How many $psNE$ does this game have?

   (c) Continue to assume $N = 3$. Determine whether this game has a symmetric $msNE$ in which each player selects X with probability p.