Game Theory **Andreas Blume**
Principles **2nd Homework**

1. Firm A considers entering a market that is currently solely served by firm B. If firm A decides to stay out, then firm B continues to enjoy a profit of 10 (million dollars), and firm A's profit remains at zero. If firm A decides to enter the market, then firm B can either acquiesce to the entry or fight entry. If firm B acquiesces, then both firms share the market and each earns a profit of 5. If firm B fights entry, they both engage in cutthroat competition and each suffers a loss of -1.

   (a) Find the strategic form representation of the game.

   (b) Find all Nash equilibria.

   (c) Which Nash equilibria survive elimination of strictly dominated strategies.

   (d) Which Nash equilibria survive elimination of weakly dominated strategies.

2. Firm A considers entering a market that is currently solely served by firm B. If firm A decides to stay out, then firm B continues to enjoy a profit of 10 (million dollars), and firm A's profit remains at zero. If firm A decides to enter the market, then firm B can either acquiesce to the entry or fight entry. If firm B acquiesces, then both firms share the market and each earns a profit of 5. If firm B fights entry, then firm A has two options: Firm A can decide to hold out in order to eventually acquire some market share, with a profit of 1 for firm A and a profit of 2 for firm B. Firm A can decide to cave in and leave the market with a profit of -1 for firm A and of 6 for firm B.

   (a) Find the strategic form representation of the game.

   (b) Find all Nash equilibria.

   (c) Which Nash equilibria survive elimination of strictly dominated strategies.

   (d) Which Nash equilibria survive elimination of weakly dominated strategies.

3. Two villages lie on opposite sides of a lake. The lake harbors a small but growing stock of valuable fish. The current value of the fish in the lake is $v = 8$. After n month, the value of the fish in the lake equals $n \times v$. After $N = 2$ months there is no further increase of the value of the fish in the lake. By custom, one village can only go out fishing during odd months, and the other village can only go out fishing during even months. No matter how many fish there are in the lake, it takes less than one month to catch them all. For simplicity, assume that fishing is done without effort and therefore costless, and that if a village goes fishing, it catches all the fish in the lake.

   (a) Formulate this situation as a T-period game, where $T = 3$, and find the strategic form of that game.

   (b) Find all Nash equilibria.

   (c) Which Nash equilibria survive elimination of strictly dominated strategies.

   (d) Which Nash equilibria survive elimination of weakly dominated strategies.

   (e) Only for this part assume that each village has three choices whenever it is its turn to decide: don't go fishing, catch half of the remaining fish, catch all the remaining fish. How many strategies does each village have?