Game Theory **Andreas Blume**
Principles **1st 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) Draw the corresponding game tree.

   (b) List the strategies of both firms.

   (c) Solve the game by backward induction.

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) Draw the corresponding game tree.

   (b) List the strategies of both firms.

   (c) Solve the game by backward induction.

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. After n month, the value of the fish in the lake equals $n \times v$. After N 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.

   (a) Formulate this situation as a T-period game, where $T > N$.

   (b) Solve this game by backward induction.

   (c) Why might one describe this situation as a dilemma?

   (d) Think of a real-world situation that resembles as closely as possible the dilemma of the two villages.