

Economics 431
Homework 4
Due Wed July 25

Part I A variant of Stackelberg game

There are two firms. Demand is linear, $p = A - BQ$, and marginal cost is constant and equal to c . Suppose that firm 1 moves first and chooses either monopoly output (M), $q_M = \frac{A-c}{2B}$, or Cournot output (C), $q_c = \frac{A-c}{3B}$. Firm 2 *observes* the choice made by firm 1 and chooses one of two output levels: either Stackelberg output (S), $\frac{1}{2}q_M = \frac{A-c}{4B}$ or Cournot output (C), $q_c = \frac{A-c}{3B}$. Let $A = 20$, $B = 1$ and $c = 8$.

- a) How many strategies does each player have and what are they?
- b) Draw the tree of this game and write down its payoff matrix
- c) Find all the Nash equilibria of this game.
- d) Find all the subgame perfect equilibria of this game.

Part II. Indivisible plants and entry deterrence

Suppose that firms can only build an integer number of plants 0, 1, 2,... and each plant produces one unit of output. In other words, output can only be adjusted in increments of one unit. Building n plants costs $3.5n$. Once the plant is installed, variable cost of production is zero. Market price is

$$p = 6 - K$$

where K is industry capacity (total number of plants).

- a) Show that a monopolist will choose to install just one plant
- b) Consider a game between two firms who simultaneously choose their number of plants K_1 and K_2 . Show that the Cournot equilibrium is for each firm to build just one plant. (Hint: represent this game by a payoff matrix)
- c) Suppose that firm 1 builds before firm 2. Show that in a subgame perfect equilibrium firm 1 builds two plants and firm 2 stays out. (Hint: represent this game by a tree).

Part III Practice exams

Winter 2002 Second Midterm, Questions 4, 5
Fall 2003 Second Midterm, Question 5

Part IV End of Chapter and practice problems

End of chapter 11.3
Practice problem 12.3