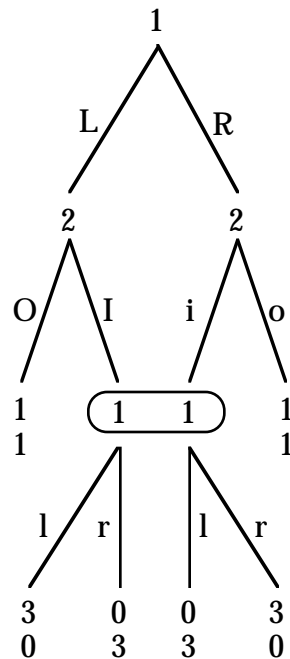


Midterm Exam – Economics 713

1. (10 points)

Consider the extensive form game pictured below. In this game, is it more appropriate to represent player 1's behavior using a mixed strategy or a behavior strategy, or is either approach equally appropriate? Explain.



2. (25 points)

A newspaper runs the following contest: Each participant mails in a postcard on which he writes an integer between 0 and 1000 (inclusive). Given the entries, the *target integer* is defined to be  $\frac{9}{10}$  times the highest entry, rounding downward if the result is not an integer. All participants who chose the target integer split a \$500 prize.

Suppose this contest is modeled as a simultaneous move game among 100 players. Using a solution concept developed in this course, determine a unique prediction of play. State the weakest possible assumptions about the players' knowledge and abilities which would justify your prediction.

3. (10 points)

Let  $G = \{N, \{S_i\}_{i \in N}, \{u_i\}_{i \in N}\}$  be a finite normal form game. We call the strategy  $\sigma_i \in \Delta S_i$  *strictly dominant* if  $u_i(\sigma_i, s_{-i}) > u_i(\rho_i, s_{-i})$  for all  $\rho_i \neq \sigma_i$  and all  $s_{-i}$ .

Can a strategy  $\sigma_i$  which places positive probability on more than one pure strategy be strictly dominant? Provide an example, or prove that this cannot occur.

4. (55 points (5, 15, 5, 25, 5))

Consider the following interaction between two entrepreneurs (players 1 and 2) who are working on a joint project and a venture capitalist (player 3) who is a potential investor in the project. First, the entrepreneurs simultaneously decide whether to devote high or low effort to preliminary work on the project. They then make a presentation to the venture capitalist. If both entrepreneurs chose high effort, the presentation goes well; otherwise it goes poorly. The venture capitalist only observes whether the presentation goes well or poorly; he does not directly observe the entrepreneurs' effort levels.

The payoffs are as follows. Each entrepreneur obtains \$5 if the venture capitalist invests and \$0 otherwise. In addition, choosing high effort costs an entrepreneur \$1, while choosing low effort is free. Investing costs the venture capitalist \$2, but if he invests he gains \$3 for each entrepreneur who chose high effort. If the venture capitalist does not invest, his payoff is \$0. All players are risk neutral.

- (i) Draw an extensive form representation of this game.
- (ii) Find all perfect Bayesian equilibria and sequential equilibria in which all players choose pure strategies.

Now, suppose that the second entrepreneur observes the first entrepreneur's effort choice before choosing her own.

- (iii) Draw an extensive form representation of this game.
- (iv) Find *all* perfect Bayesian equilibria and sequential equilibria.
- (v) Provide an intuitive explanation for any differences between the sequential equilibrium outcomes you found in parts (ii) and (iv).