Economics 611    Game Theoretic Microeconomics
Spring 2012   First Exam

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"Syracuse University students shall exhibit honesty in all academic endeavors. Cheating in any form is not tolerated, nor is assisting another person to cheat. The submission of any work by a student is taken as a guarantee that the thoughts and expressions in it are the student's own except when properly credited to another. Violations of this principle include: giving or receiving aid in an exam or where otherwise prohibited, fraud, plagiarism, the falsification or forgery of any record, or any other deceptive act in connection with academic work. **Plagiarism is the representation of another's words, ideas, programs, formulae, opinions, or other products of work as one's own either overtly or by failing to attribute them to their true source.**" (Section 1.0, University Rules and Regulations)

**WARNING!!**

While homework problems may have been done cooperatively, **exams are individual work.** Do not communicate about this exam with **anyone** except the instructor [x3-2345 or e-mail jskelly@maxwell.syr.edu]. **Violation of this rule will result in a grade of 0 for the exam.** Any notices will be sent to you by e-mail; check occasionally.

**EXPLAIN** your answers carefully.

**DUE: 9:30 am, Thursday, February 23, in class.**
EXPLAIN your answers carefully. DUE: 9:30 am, Thursday, February 23, in class. The four problems are each worth 25 points.

1. A Cournot duopoly problem. Firm \( i \) strives to maximize profit

\[
\pi_i = pQ_i - wL_i
\]

where \( P \) is output price, \( Q_i \) is firm output, \( w \) is the wage rate, and \( L_i \) is labor employed. Price is given by the inverse demand curve:

\[
p = a - b(Q_i + Q_j);
\]

wage is given by

\[
w = c + d(Q_i + Q_j);
\]

and technology is specified by \( Q_i = L_i \). Assume \( a, b, c, \) and \( d \) are all positive and \( a > c \); determine best response correspondences and all Nash equilibria of this game. (Assume global maxima exist.)

2. Consider a simultaneous bidding game for an object that the two bidders value differently. Bidder \( i \)'s valuation is \( v_i \) (a non-negative integer); assume \( |v_2 - v_1| \leq 1 \). The rules are that each player submits a bid \( b_i \) (a non-negative integer) in a sealed envelope. The envelopes are then opened, and the bidder who has submitted the highest bid gets the object but pays the amount of that highest bid, so the payoff is \( v_i - b_i \). If both bidders submit the highest bid, each gets the object with probability \( \frac{1}{2} \), so the payoff is \( \frac{(v_i - b_i)}{2} \). Bids must be in (integer) dollar multiples.

Are there any Nash equilibria? If so, what are they?
Are there ever Nash equilibria where both players bid their true valuation?

3. Consider the game tree on the next page. Consider the possibility that Player \#1 at her first decision node plays \( L \) with probability \( p \) and \( R \) with probability \( 1 - p \); and at her second decision node plays \( U \) with probability \( q \) and right with probability \( 1 - q \). Can this be represented as a mixed strategy? If so, list some pure strategies and their probabilities such that the mixed strategy represents this possibility. If not, explain why not.

4. Analyze a modified centipede game, where it takes two stop (down) decisions to end the game early. After a first stop, the game continues just as the original centipede game did.

What are the subgame perfect NE?
Does there exist a NE that is not subgame perfect?
\[
\begin{array}{cccccccc}
0 & 1 & 2 & \cdots & v_1 - 1 & v_1 & v_1 + 1 & v_1 + 2 \\
0 & v_{1/2} & 0 & 0 & \cdots & 0 & 0 & 0 & 0 \\
1 & v_1 - 1 & \frac{1}{2}(v_1 - 1) & 0 & \cdots & 0 & 0 & 0 & 0 \\
2 & v_1 - 2 & v_1 - 2 & \frac{1}{2}(v_1 - 2) & \cdots & 0 & 0 & 0 & 0 \\
3 & v_1 - 3 & v_1 - 3 & v_1 - 3 & \cdots & 0 & 0 & 0 & 0 \\
\vdots & \vdots & \vdots & \vdots & \cdots & \vdots & \vdots & \vdots & \vdots \\
v_{i - 1} & 1 & 1 & 1 & \cdots & \frac{1}{2} & 0 & 0 & 0 \\
v_i & 0 & 0 & 0 & \cdots & 0 & 0 & 0 & 0 \\
v_{i + 1} & -1 & -1 & -1 & \cdots & -1 & -1 & -\frac{1}{2} & 0 \\
v_{i + 2} & -2 & -2 & -2 & \cdots & -2 & -2 & -2 & -1 \\
\vdots & \vdots & \vdots & \vdots & \cdots & \vdots & \vdots & \vdots & \vdots \\
\end{array}
\]

![Game Tree](image-url)