All Syracuse University policies and procedures concerning academic honesty apply to this course:

"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 to 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 21, in class.
**Economics 611 Game Theory    Spring 2008    First Exam**

*EXPLAIN your answers carefully. DUE: 9:30 am, Thursday, February 21, in class. The five problems are each worth 20 points.*

**1.** Consider a first-price sealed bid auction of an object with two bidders. Each bidder i’s valuation is a non-negative integer \( v_i \), which is known to both bidders. The auction rules are that each player submits a bid \( b_i \) (also 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 auctioneer the amount of that highest bid. If both bidders submit the highest bid, each gets the object with probability 1/2.

**(A)** Assume \( v_2 = v_1 > 2 \). Are there any Nash equilibria? If so, what are they?

**(B)** Assume \( v_2 = v_1 + 1 \) and \( v_1 > 2 \). Are there any Nash equilibria? If so, what are they?

**2.** A law is passed requiring a monopolistic soft-drink manufacturer to separate the production department and the marketing department. The marketing department chooses the price \( P \geq 0 \) to charge for a bottle of the firm’s soft drink and the production department chooses the level of output \( Q \geq 0 \). The two departments are forbidden to discuss their decisions with each other and, therefore, move simultaneously. Managers in both departments own shares in the firm and want to maximize its profits

\[
\pi = P \cdot S - Q^2
\]

where \( S \) denotes the firm’s sales. Sales can not exceed the firm’s output, nor can they exceed the market demand. Unsold output is thrown away. This means \( S = \min\{Q, D(P)\} \) where market demand is

\[
D(P) = 8 - P \text{ if } P \leq 8 \text{ and } D(P) = 0 \text{ if } P > 8.
\]

Are there any Nash equilibria? If so, what are they?
3. Consider the Mary-Tom auction game:

Professor Brown announces he is going to auction off a dollar. A first bid must be 50 cents and then later bids proceed in increments of 50 cents. Bidders can not bid twice in a row, and once a bidder passes she does not get to bid again. The highest bidder gets the dollar, but both the highest and second-highest bidders pay their bids to Professor Brown. (If a player doesn’t bid, they pay and receive nothing.) Mary and Tom are the only two bidders; it is common knowledge that they each have only $2 in their wallets; and Mary gets to make the first bid.

Are there any subgame perfect Nash equilibria? If so, what are they?

4. There are two players. Player #1 offers a point \( s_0 \in \mathbb{R} \). Player #2 can then accept \( s_1 \) or reject it; in the latter case the outcome \( s \) is the status quo value \( s_0 \in \mathbb{R} \). If #2 accepts the outcome \( s \) is \( s_1 \). In both parts below, player #2’s preferences are represented by \( -(s - b_2)^2 \) where \( b \) is #2’s bliss point.

**Part 1** In this part, player #1’s preferences are represented by \( s \) (i.e., she prefers higher values of \( s \)). Find the subgame perfect Nash equilibria. (Hint: Your answer may depend on the sizes of the parameters \( s_0 \) and \( b_2 \)).

**Part 2** In this part, player #1’s preferences are represented by \( -(s - b_1)^2 \) where \( b_1 \) is #1’s bliss point. Find the subgame perfect Nash equilibria. (Hint: Your answer may depend on the sizes of the parameters \( s_0, b_1, \) and \( b_2 \)).