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.

*Keep a Xerox copy of your answers to the exam*

**DUE: Noon, Tuesday, May 8th.**

Under no circumstances are you to give your exam to someone else to turn in for you. Doing so will result in a grade of 0 for the exam.
EXPLAIN your answers carefully.

1. (Moral Hazard) For the owner-manager problem in the text in Section 14.C, when the owner as well as manager is able to observe \( \theta \), suppose the owner’s revenue function is

\[
\pi(e) = e^\alpha, \text{ where } 0 < \alpha < 1.
\]

Also suppose the manager’s utility function is

\[
v(w - g(e, \theta)) = (w - g(e, \theta))^{1/2},
\]

where

\[
g(e, \theta) = e^{\beta}/\theta \text{ for } \beta > 1.
\]

Get solution values for all the variables and confirm that \( e^H > e_L \).

2. (Inequality constraints) A profit-maximizing firm sells goods in two periods in competitive markets. Output price in period 1 is $1, output price in period 2 is \( p \). In period 1, the firm produces \( Q_1 \) units, stores \( S \) and sells \( Q_1 - S \). In period 2, the firm produces \( Q_2 \) and sells \( Q_2 + S \). Production costs are

\[
C_1 = (1/2)Q_1^2; \quad C_2 = Q_2^2.
\]

The firm faces three non-negativity constraints: \( Q_1 \geq 0, Q_2 \geq 0, S \geq 0 \) and two non-trivial inequality constraints: \( S \leq C \), where \( C \) is storage capacity, and \( S \leq Q_1 \).

[Assume both parameters, \( p \) and \( C \) are positive.]

A. Find all solution values for \( Q_1, Q_2, \) and \( S \) to the problem of maximizing undiscounted profit.

B. How much would the firm pay to obtain another unit of storage space? [That is, find the solution value for the multiplier associated with the capacity constraint, \( S \leq C \).]

Your answers to A and B will naturally depend on the values \( p \) and \( C \). As part of your answer, present a table or more displaying that dependence.
3. (Gibbard-Satterthwaite) [25 points]

There are 5 alternatives and 3 individuals, each with strong orderings over the alternatives. For each of the following two social choice rules display a preference profile at which at least one person has an incentive to misrepresent their preference ordering and describe that manipulation.

Rule I. Proceed by stages:

Stage 1. If one alternative is at the top of the preference ordering for all individuals, that alternative is chosen.

Stage 2. Otherwise, if one alternative is in the top two ranks for all individuals, that alternative is chosen. If more than one fits this description, choose the alphabetically earliest.

Stage 3. Otherwise, if one alternative is in the top three ranks for all individuals, that alternative is chosen. If more than one fits this description, choose the alphabetically earliest.

And so on...

Rule II. Proceed by stages:

Stage 1. Look at everyone's top. If two people have the same top, $g(u)$ is the top for the lowest labeled individual whose top matches someone else’s. If not, go to

Stage 2. Look also at everyone's top two ranked alternatives. If there are two people with the same alternative in their top two, that alternative with the lowest labeled individual who has a match. If it is the same lowest labeled individual for more than one match, choose that person’s higher-ranked alternative.

And so on...