Marks

[10] **1.** Consider the problem: maximize x_1 subject to $x_1 \geq 4$, $x_1 \geq 8$, $x_1 \geq 0$. Write this as a linear program in standard form. Use the two-phase method, **adding an auxilliary variable x_0 to EVERY slack variable equation in the dictionary,** to solve this LP. Use the smallest subscript rule to break any ties for entering or leaving variables.

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[20] **2.** (4 points for each part) Briefly justify your answers:

(a) Find the value of "Alice announces a pure strategy" and "Betty announces a pure strategy" for the matrix game:

$$A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$$

What do you conclude about the value of the mixed strategy games?

(b) In the matrix game

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 4 & 3 & 1 \\ 5 & 2 & 1 \end{bmatrix}$$

someone claims that Alice's optimal mixed strategy is [1/2 1/2 0] and that Betty's is [1/3 1/3 1/3]. Make a quick calculation (without using the simplex method) to determine whether or not this is true; explain why your quick calculation works.

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(c) Let A be a 100×2 matrix game. Argue that Alice has an optimal mixed strategy where she plays at most two rows.

(d) Give an example of a linear program whose first pivot must be degenerate. How do you know that the first pivot must be degenerate?

(e) Give an example of a linear program whose first two pivots must be degenerate. How do you know that the first two pivots must be degenerate?

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Be sure that this examination has 6 pages including this cover

The University of British Columbia

Midterm Examinations - October 2014

Mathematics 340

Closed book examination Time: 50 minutes

Name _____ **Signature** _____

Student Number _____ **Instructor's Name** _____

Section Number _____

Special Instructions:

Calculators, notes, or other aids may not be used. Answer questions on the exam. This exam is two-sided!

Rules governing examinations

1. Each candidate should be prepared to produce his library/AMS card upon request.

2. Read and observe the following rules:

No candidate shall be permitted to enter the examination room after the expiration of one half hour, or to leave during the first half hour of the examination. Candidates are not permitted to ask questions of the invigilators, except in cases of supposed errors or ambiguities in examination questions.

CAUTION - Candidates guilty of any of the following or similar practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.

(a) Making use of any books, papers or memoranda, other than those authorized by the examiners.

(b) Speaking or communicating with other candidates.

(c) Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.

3. Smoking is not permitted during examinations.

1		10
2		20
Total		30