Math 482 **HW3** Name: ______________________

Due Friday, February 12, 2016

All students (either in section E13 or E14) must do all four problems. Note that the third problem counts as two problems.

1. Solve the LP in Example 2.7 (pages 51–52) of the book using Bland's anticycling algorithm (see section 2.7).

2. For the previous problem, find the matrix by which we have to pre-multiply the original tableau in order to get the final tableau. In other words, if T is the initial tableau and $\tilde{T}$ is the final tableau, then find the matrix X such that $XT = \widetilde{T}$. You should use the fact that $XT_i = \widetilde{T_i}$ where T_i is column i of T and $\widetilde{T_i}$ is column i of $\widetilde{T}$.

3. *This problem counts as two problems. You must show the steps of the simplex procedure on this problem, but you are encouraged to use a linear program solver to check your answers to this problem. Please make sure the first phase is correct before proceeding to the second stage.*

   Introduce 3 artificial variables and solve with two-phase simplex algorithm the LP represented by the tableau below.

		x_1	x_2	x_3	x_4	x_5
-z	0	4	8	14	2	10
	14	2	2	4	2	4
	12	2	4	6	2	2
	8	2	2	2	4	2

4. *You can use a calculator or computer algebra system to help with this problem, but you must show all your steps.*

   Suppose that at a stage of the simplex algorithm, we have the following tableau $\widetilde{T}$:

		x_1	x_2	x_3	x_4	x_5	x_6
$-z$	8	0	8/3	−11	0	4/3	0
x_1	4	1	2/3	0	0	4/3	0
x_4	2	0	−7/3	3	1	−2/3	0
x_6	2	0	−2/3	−2	0	2/3	1

   The inverse of the current basis is

$$A_B^{-1} = [A_1, A_4, A_6]^{-1} = \frac{1}{3}\begin{pmatrix} 1 & 1 & -1 \\ 1 & -2 & 2 \\ -1 & 2 & 1 \end{pmatrix}$$

   and

$$c_B^T = [c_1, c_4, c_6] = [-1, -3, 1].$$

   Find vectors c and b and the matrix A that correspond to the original linear program.