

Individual work.

Due: 11am, Thursday October 19.

Note time change this week.

1. Consider the following tableau (written in shorthand—we write each variable above a column containing its coefficients).

$z$	$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$	$x_7$	$x_8$	$x_9$	$x_{10}$	$x_{11}$	$x_{12}$	
1	2	1	0	0	-1	-2	0	-3	2	-2	3	0	= 0
0	0	-1	1	0	1	1	0	1	-1	0	-1	-1	= 0
0	1	1	0	1	-1	0	-1	-1	0	-1	1	0	= 0.

The initial basic variables are  $x_3$  and  $x_4$ . Perform a pivot with  $x_5$  as entering variable, followed by a pivot with  $x_6$  as entering variable. Do you see a pattern? Explain how the simplex method could cycle in twelve iterations, starting from the tableau above. What would happen if you used the smallest subscript rule?

2. The following claims concern a single pivot of the simplex method, from a current tableau to a new tableau. State whether each claim is true or false. Justify your answers: if you state a claim is true, explain why; if you state it is false, give an example illustrating that it can fail.
- (i) After a degenerate pivot, the new tableau must be degenerate.
  - (ii) Starting from a degenerate current tableau, any pivot must be degenerate.
  - (iii) If the new tableau is degenerate, the pivot must have been degenerate.
  - (iv) A degenerate pivot must start from a degenerate current tableau.