DEGENERACY

WHENEVER A TIE EXISTS ON WHICH VARIABLE SHOULD GO OUT THEN IN THE NEXT GENERATION (ITERATION) ONE OR MORE BASIC VARIABLES WILL NECESSARILY BECOME ZERO. THE NEW SOLUTION IS CALLED DEGENERATE.
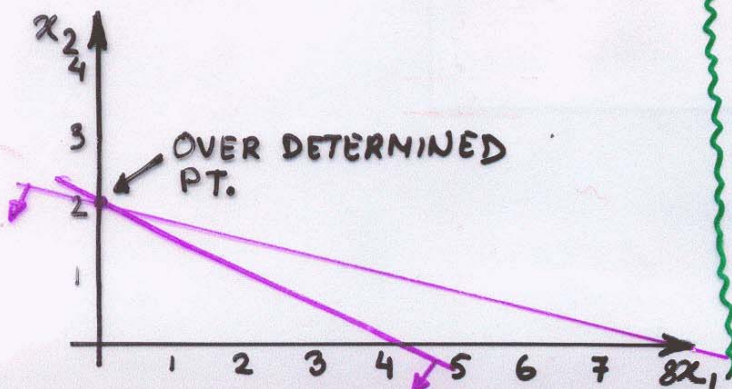
MAX $Z = 3x_1 + 9x_2$
s.t.
$$x_1 + 4x_2 \leq 8$$
$$x_1 + 2x_2 \leq 4$$
$$x_1, x_2 \geq 0$$

Max $Z = 3x_1 + 9x_2$
s.t.
$$x_1 + 4x_2 + s_1 = 8$$
$$x_1 + 2x_2 + s_2 = 4$$
$$x_1, x_2 \geq 0$$

x_2 ENTERS S_1 OR S_2 LEAVES

BASIC	x_1	x_2	S_1	S_2	Solution	RATIO
Z	-3	-9	0	0	0	
S_1	1	4	1	0	8	$\frac{8}{4} = 2$
S_2	1	2	0	1	4	$\frac{4}{2} = 2$

x_1 ENTERS S_2 LEAVES

BASIC	x_1	x_2	S_1	S_2	SOLUTION	RATIO
Z	-3/4	0	9/4	0	18	
x_2	1/4	1	1/4	0	2	$2/(\frac{1}{4}) = 8$
S_2	1/2	0	-1/2	1	0	$0/(\frac{1}{2}) = 0$

OPTIMAL REACHED

BASIC	x_1	x_2	S_1	S_2	SOLUTION	RATIO
Z	0	0	3/2	3/2	18	
x_2	0	1	1/2	-1/2	2	
x_1	1	0	-1	2	0	

OVER DETERMINED PT.

NOTE:
DEGENERACY CAN LEAD TO CYCLING. LOOK AT T2 & T3; NO CHANGE IN OBJECTIVE FUNCTION.