

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.

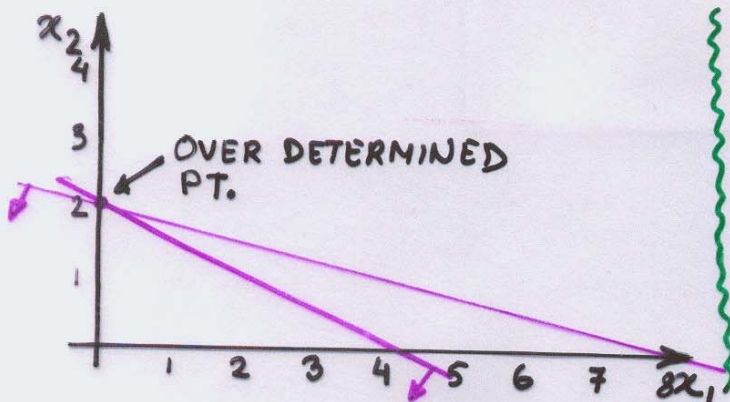
$$\begin{aligned} \text{MAX } Z &= 3x_1 + 9x_2 \\ \text{s.t. } x_1 + 4x_2 &\leq 8 \\ x_1 + 2x_2 &\leq 4 \\ x_1, x_2 &\geq 0 \end{aligned}$$

$$\begin{aligned} \text{Max } Z &= 3x_1 + 9x_2 \\ \text{s.t. } x_1 + 4x_2 + s_1 &= 8 \\ x_1 + 2x_2 + s_2 &= 4 \\ x_1, x_2 &\geq 0 \end{aligned}$$

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	
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	
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	
x ₂		0	1	1/2	-1/2	2	
x ₁		1	0	-1	2	0	



NOTE:

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