Mod 4 - Optimization Techniques

→ LPP

* Basic ~~Varia~~ Solution

① Calculate No. of Basic solution $^nC_m = \frac{n!}{m!(n-m)!}$

② Make Table with following columns & rows = No. of Basic Solution

Sr No	Basic Variable	Non-Basic Variable	Eq^n Values	Z	feasible $x_i \geq 0$	Non degenerate $x_i > 0$	Optimum ↓ for max & for min

* Standard form

(1) The objective function is maximization type
Else $Z = -Z$

(2) All constraints are expressed as equations
$\leq \rightarrow +s_1$
$\geq \rightarrow -s_1$

(3) Right hand side of each constraint is non negative
Else, multiply whole eq by $-ve$

(4) All variables are non-negative
Else, let unrestricted variable $x_i = x_i' - x_i''$

* Simplex Method

Follow Algorithm

Usual steps

① Standard form

② IBFS $x_1 = x_2 = x_3 \ldots = 0$

③ Simplex Table

④ Findl answer :

Z_{max} (If $z \to z'$ then final answer also -ve)

$x_1 \quad x_2 \ldots s_1 \quad s_2 \ldots$

Simplex Table format :

Iteration No.	Basic Variable	Coefficients of x_1	x_2	x_3	s_1	s_2	RHS Sol^n	Ratio
0	z							
	s_1							
	s_2							

Note : if $x_1 \ x_2 \ x_2 = 0$ in table for z there exists an alternate solution

→ NLPP

* Maxima Minima

1) Find $\frac{\partial z}{\partial x_1}, \frac{\partial z}{\partial x_2}, \frac{\partial z}{\partial x_3}$

2) Put them $= 0$ & find x_1, x_2, x_3

3) Get Hassien Matrix

4) Find minors/ determinants D_1, D_2, D_3 → ++++ minima → +-+- maxima

5) Calculate z by putting x_1, x_2, x_3

$$H = \begin{bmatrix} \frac{\partial z^2}{\partial x_1^2} & & \\ & \frac{\partial^2 z}{\partial x_2^2} & \\ & & \frac{\partial^2 z}{\partial x_3^2} \end{bmatrix}$$

classmate

Date

Page

* ## lagrangian method (For equality constraints)

1) Put in $L = f(x_1, x_2) - \lambda\, h(x_1, x_2)$
2) Get $\frac{\partial L}{\partial x_1}, \frac{\partial L}{\partial x_2}, \frac{\partial L}{\partial x_3}$
3) Put 0, get x_1, x_2, λ (Might need extra calculation)
4) Find Δ_3
5) $\Delta_3 \rightarrow +ve \rightarrow$ maxima

   $\Delta_3 \rightarrow -ve \rightarrow$ minima
6) Put x_1 x_2 x_3 & get z

$$\Delta_3 = \begin{bmatrix} 0 & \frac{\partial h}{\partial x_1} & \frac{\partial h}{\partial x_2} \\ \frac{\partial h}{\partial x_2} & co x_1 & 0 \\ \frac{\partial h}{\partial x_2} & 0 & co x_2 \end{bmatrix}$$