IP FORMULATIONS

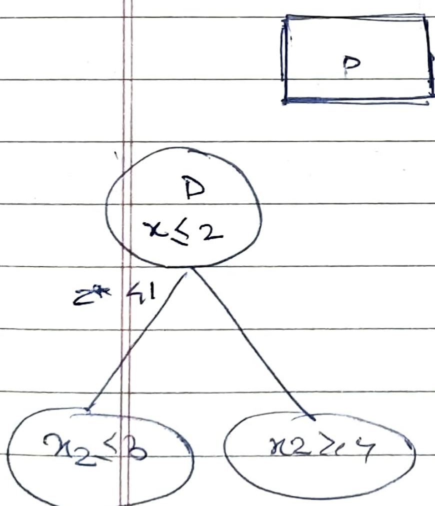
maximize $5x_1 + 8x_2$

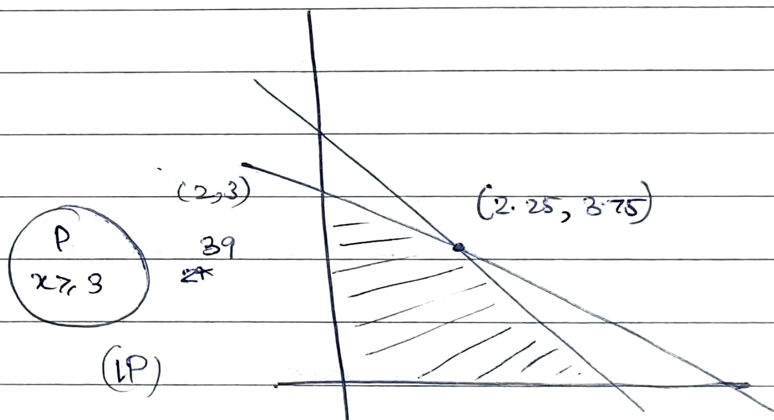
st. $x_1 + x_2 \leq 6$

$5x_1 + 9x_2 \leq 45$

$x_1, x_2 \geq 0$

$x_1; x_2 \in \mathbb{Z}$





(LP)

no need

further to expand.

Knapsack – some max. wt. you can carry. carry more costly items then.

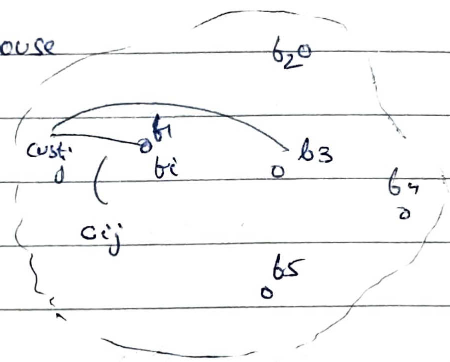
Max. $c^T x$	real	LP
$A x \leq b$	integer	IP
	binary.	BIP

mixed MIP

MIP FORMULATION WAREHOUSE

x .= from warehouse

how many.



$\sum x = d$ → demand.

$$\sum_i x_{ij} = d_j$$

min. $\sum c_{ij}$

$$\sum_j x_{ij} \le y_i d_j$$

min. supply cost + operating.

$$\sum_j (x_{ij} - y_i d_j)$$

x supply from warehouse > 0 only if warehouse open

$$\sum_{j=1}^{n} x_{ij} - y_i \left(\sum_j d_j\right) \le 0$$

total customer demand satisfied.

travelling salesman. $x_{ij} \in \{0, 1\}$

min $\sum c_{ij} x_{ij}$

$$\sum_i x_{ij} = 1$$

$$\sum_j x_{ij} = 1$$

$B \leftarrow$ max no. (∞)

$f_1(x) \leq b_1 + y_1 B$ $\quad y_i = 1$ trivially true

$f_2(x) \leq b_2 + y_2 B$ $\quad y_i = 0$ constraint is active.

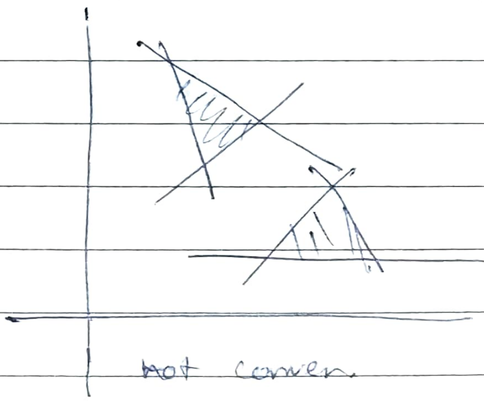
$y_1, y_2 \in (0, 1)$ assume many such constraints.

$y_1 + y_2 = 1$

$\Sigma y_i = 1$ 100 constraints

$\Sigma y_i = n-1$ Only 1 is ~~active~~ inactive.

exactly 1 true.



atleast 1 true.

$f_i(x) \leq b_i$ } set. n_1

$f_j(x) \leq b_n$ } set n_2.

~~not~~ conver.

either or

$y_1 + y_2 = 1$.

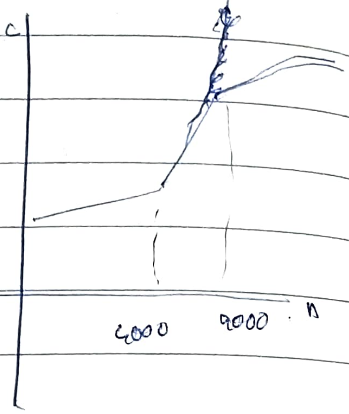
kb4xi2

(1) (b) (b) 3(a) (b) (a)

max $c^T x$ $\longrightarrow$ cost of manufac..

x not constant over period.

$f_i(x) \leq b_i$ }



$c^T x$ no longer linear function.

non-linear → piecewise linear.

$c_1 x$ if $x \leq 4k$

$c_2 x$ if $x_1 \geq 4n$ $\leq 9k$.

$4000 w_1 \leq x_1 \leq 4000$

$5000 w_2 \leq x_2 \leq 5000$

$0 \leq x_3 \leq 6000$

$w_1, w_2 \in \{0, 1\}$.