LET US INTRODUCE A 0-1 VARIABLE y_{ij}

$$y_{ij} = \begin{cases} 0 & \text{if } j \text{ precedes } i \\ 1 & \text{if } i \text{ precedes } j \end{cases}$$

THEN THE EARLIER TWO CONSTRAINTS CAN BE WRITTEN AS (M IS A LARGE POSITIVE NUMBER)

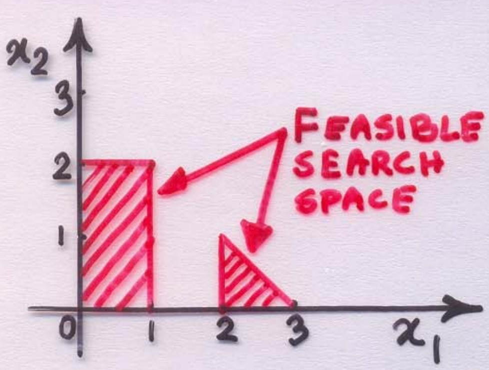
$$M y_{ij} + (x_i - x_j) \geq a_j \quad \ldots\ldots (1)$$

$$M(1 - y_{ij}) + (x_j - x_i) \geq a_i \quad \ldots\ldots (2)$$

NOTE: IN THE EVENT i precedes j (i.e. $y_{ij} = 1$) CONSTRAINT (2) BECOMES ACTIVE AND (1) REDUNDANT. THIS IS WHAT WE SET OUT TO DO; THAT IS, IF IT IS BENEFICIAL TO DO i BEFORE j THEN STARTING TIME OF j MUST BE AT LEAST a_i UNITS AFTER THE START OF PROJECT i.

ALSO NOTE IF y_{ij} IS USED IN THE FORMULATION THERE IS NO NEED TO USE y_{ji}.

CONSIDER A PROBLEM WHOSE FEASIBLE SEARCH SPACE IS GIVEN AS FOLLOWS:



THE QUESTION IS HOW DOES ONE REPRESENT THIS NON-CONVEX SEARCH SPACE THROUGH LINEAR CONSTRAINTS

THIS IMPLIES

$$\begin{matrix} x_1 \leq 1 \\ x_2 \leq 2 \end{matrix} \quad \text{OR} \quad \begin{matrix} x_1 \geq 2 \\ x_1 + x_2 \leq 3 \end{matrix}$$

DEFINE $y = \begin{cases} 1 & \text{if LEFT AREA IS USED} \\ 0 & \text{if RIGHT AR. IS USED.} \end{cases}$

$$x_1 + My \geq 2$$

$$x_1 + x_2 - My \leq 3$$

$$x_1 - M(1-y) \leq 1$$

$$x_2 - M(1-y) \leq 2$$