

LP RELAXATION

- GM LP

- Solvers LP

- BB B IP

- Bala's algorithm.

= graphs, algorithms

- OM ML /

- enng. a

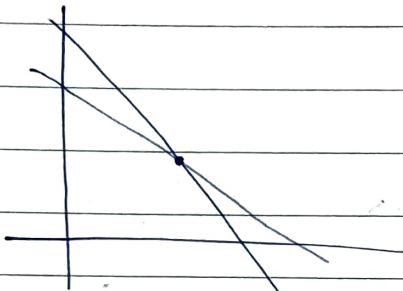
linear algebra

$$Ax = B.$$

What properties of  $A, B, c$ 

makes problem nice?

(some LP problems easy).



① Solve int. constraint.

② solve LP.

③ how bad approx. soln. (rounded) is?

approximation algorithms.

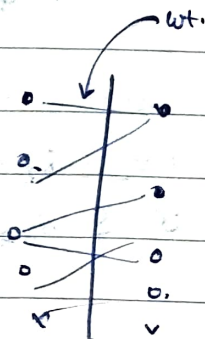
④ Yet another way of solving IP.

(how you design algo with LP relaxation).

A - max. wt. bipartite matching.

B - min. vts. cover.

C - max. indep. set.

edges only from  $x - y$ 

(not among themselves).

$$|x| = |y|$$

$$\max_x \sum w_e x_e \quad x_e \in \{0, 1\} \quad // 1 \text{ if selected.}$$

$$\sum x_e = 1 \quad \forall v \in V$$

LPR:

$$x_e \in [0, 1] \quad (\text{real interval, relaxed const.})$$

$$\downarrow$$

$$x^*$$

round to real soln.

$$Z_{IP}^* = Z_{LP}^*$$

 $\epsilon = 1$ 

$$\sum_e w_e y_e = \sum_e w_e x_e^* + (\epsilon \Delta) \rightarrow \underline{\underline{0}}$$

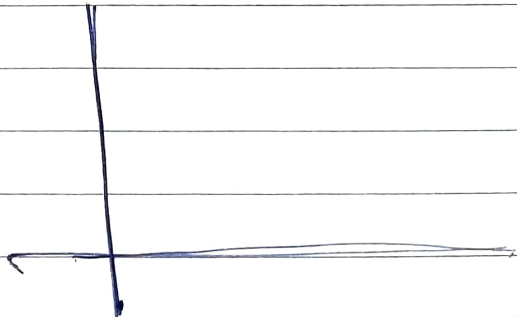
$$y_e^* \leftarrow x_e^*$$

using rounding.

bagairiz

①. a ②

②. b



$$\min. Z = 3x_1 + 5x_2$$

$$-2x_1 + 6x_2 \geq 2$$

$$-5x_1 - x_2 \geq -2$$

$$5x_1 + 4x_2 \geq 3$$

