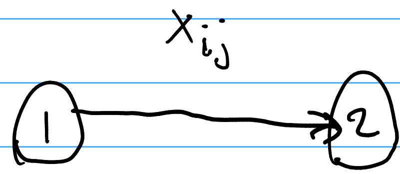
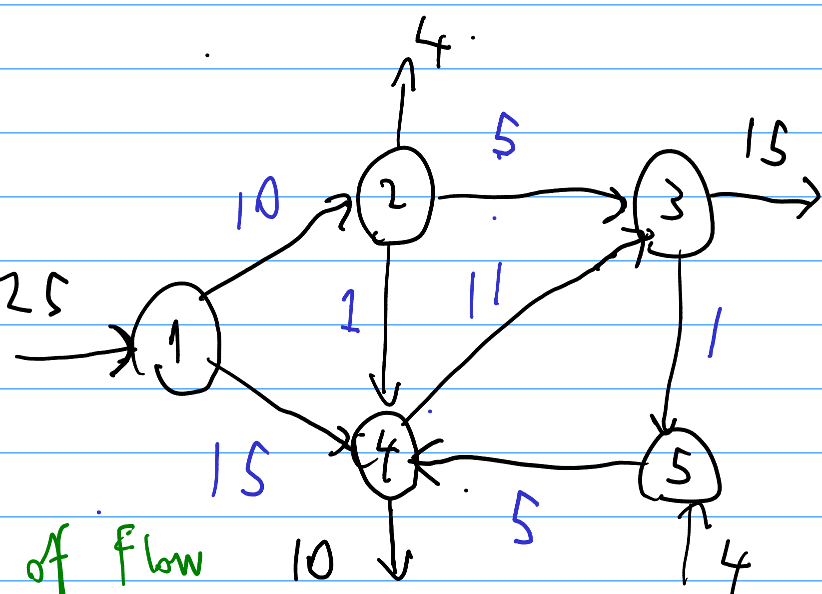
Flow decomposition



$x_{12} = 5$

e.g.



Conservation of flow

x_{ij} Flow from node i to node j

b_i Flow

$$\boxed{\sum_j x_{ij} - \sum_j x_{ji} = b_i} \qquad \boxed{\sum_i b_i = 0}$$

e.g. For node 1

$$\sum_j x_{ij} = x_{14} + x_{12} = 25$$

$$\sum_j x_{ji} = 0$$

$$b_i = 25$$

For node 2

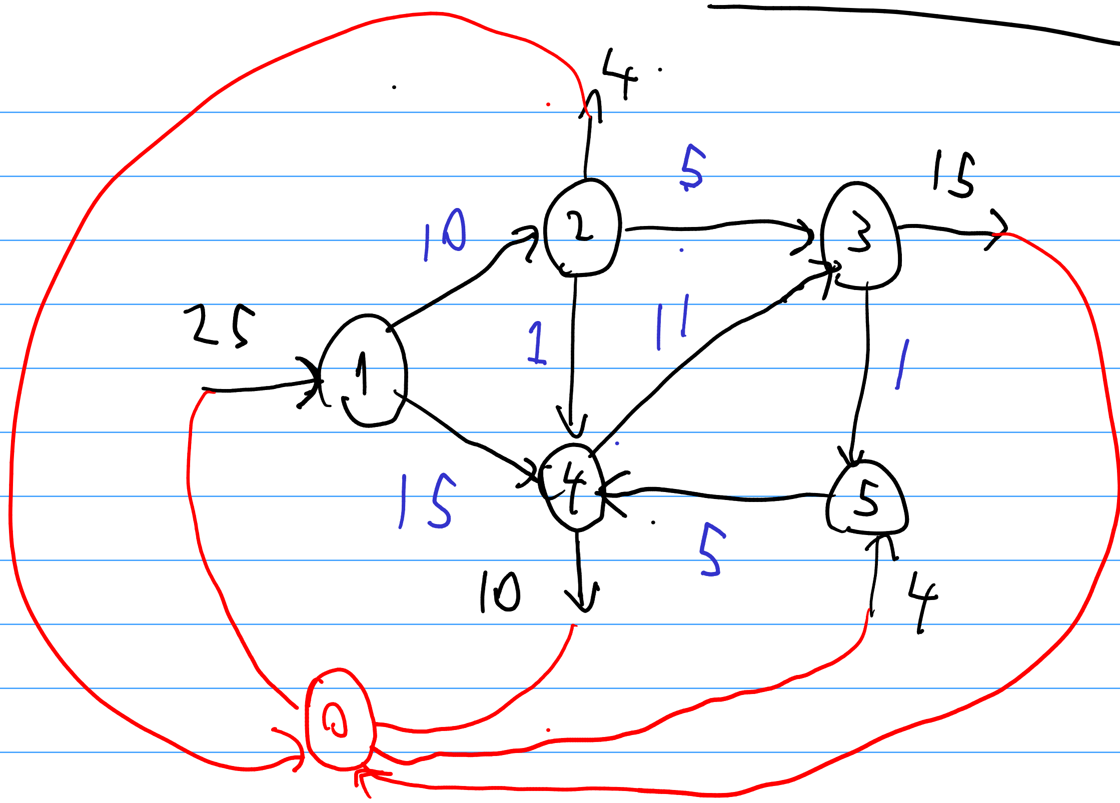
$$\sum_j x_{ij} = x_{23} + x_{24}$$

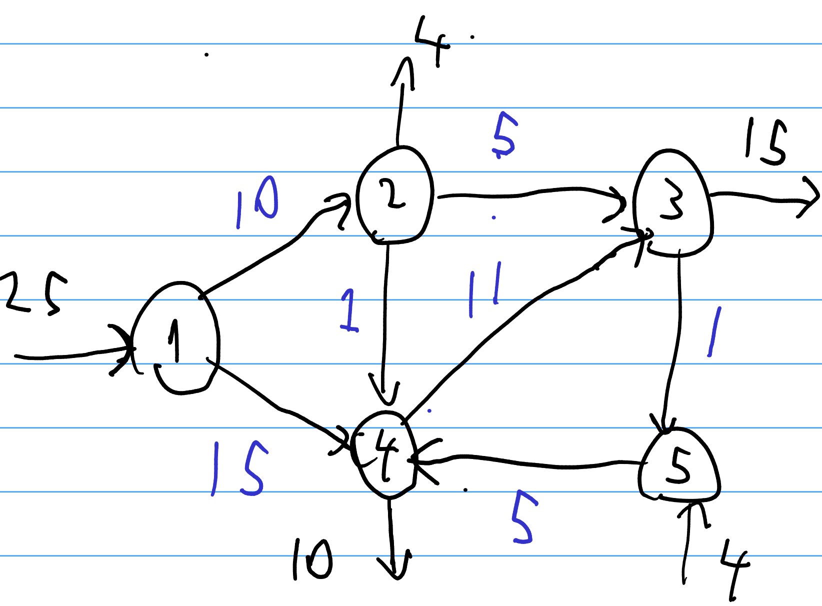
$$= 5 + 1 = 6$$

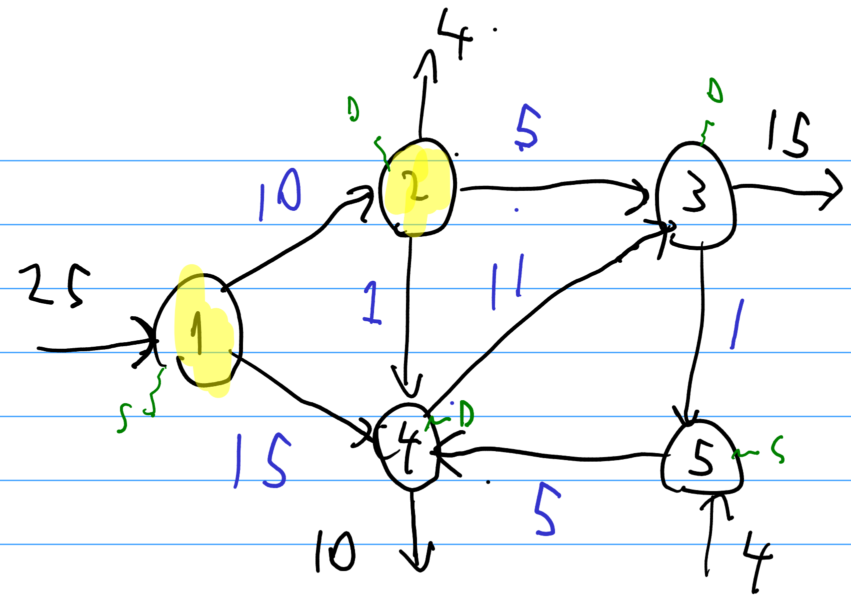
$$\sum_j x_{ji} = x_{12} = 10$$

$$b_2 = -4$$

Fictitious Node 0



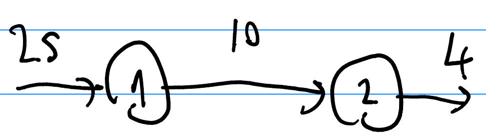




Describing the network Flow in Path and Cycles instead of Arc Flows is Known as Flow decomposition.

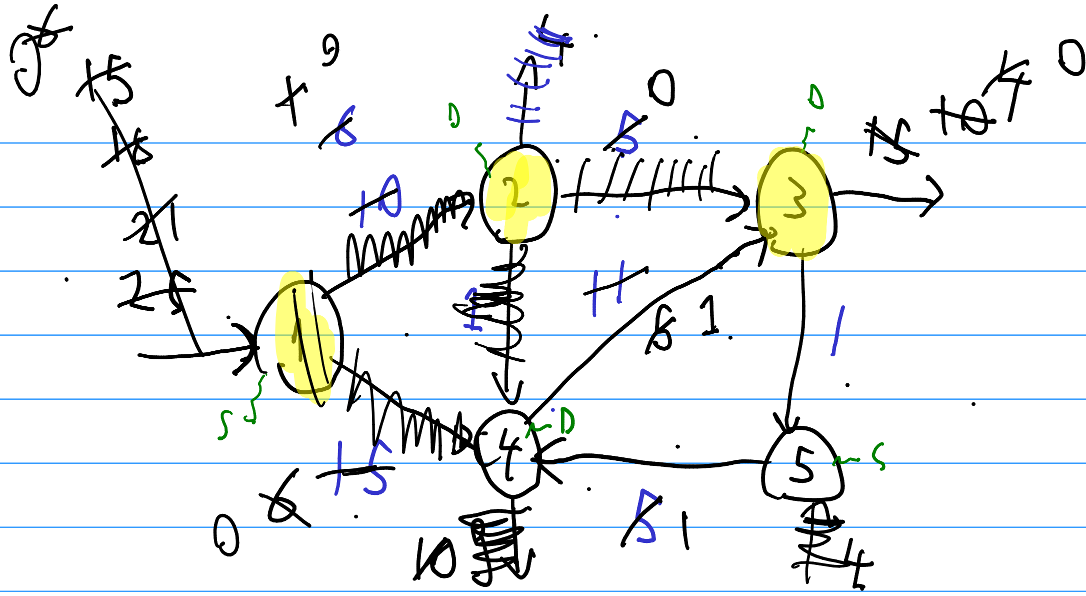
1. Pick a supply node, do search until you Find a demand node.
2. Agument the Flow From supply to demand
3. Describe the Path

e.g.



$$\delta = \min\left(x_{ij},\ \overbrace{b_i}^{\text{Supp}},\ \overbrace{-b_i}^{\text{Demd}} \right) = 4$$

$$\boxed{P_1 = (1, 2) \qquad \delta = 4}$$



$\xrightarrow{21} 1 \xrightarrow{6} 2 \xrightarrow{5} 3 \xrightarrow{15}$ $\quad \delta = \min(6, 5, 21, 15) = 5$

$\boxed{P_2 = \{1, 2, 3\} \quad \delta = 5}$

$P_3 = \{1, 2, 4\} \quad \delta = 1$

$P_4 = \{1, 4\} \quad \delta = 9$

$P_5 = \{1, 4, 3\} \quad \delta = 6$

$P_6 = \{5, 4, 3\} \quad \delta = 4$

$C_1 = \{3, 5, 4, 3\} \quad \delta = 1$ $\qquad \delta_C = \min(x_{ij})$