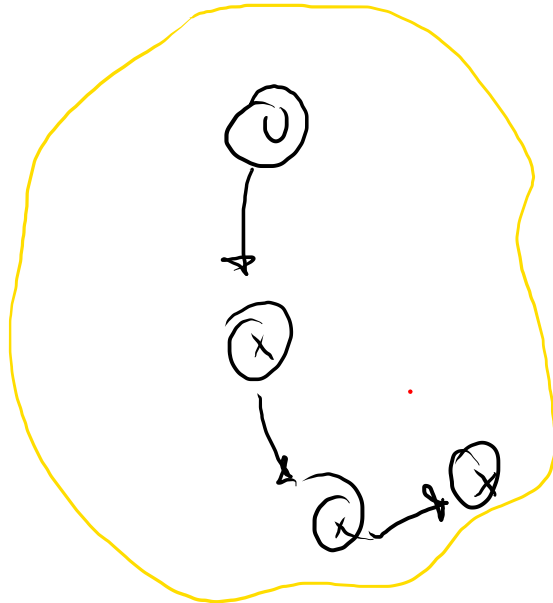
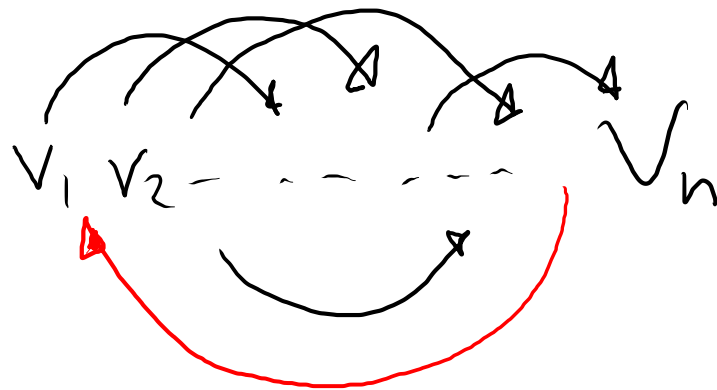
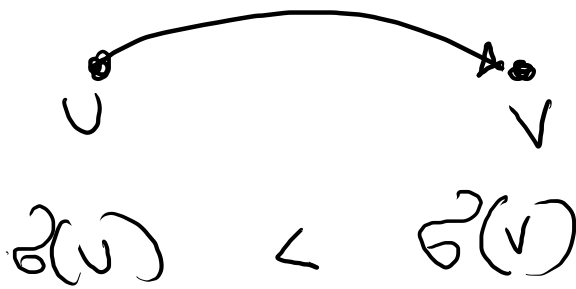
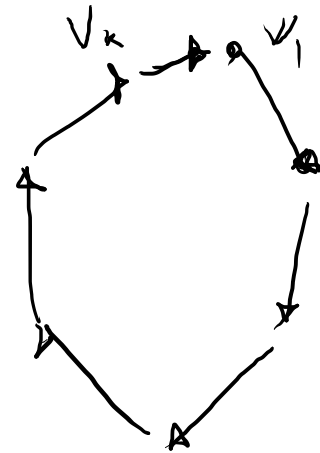


invario [u]



fine [u]

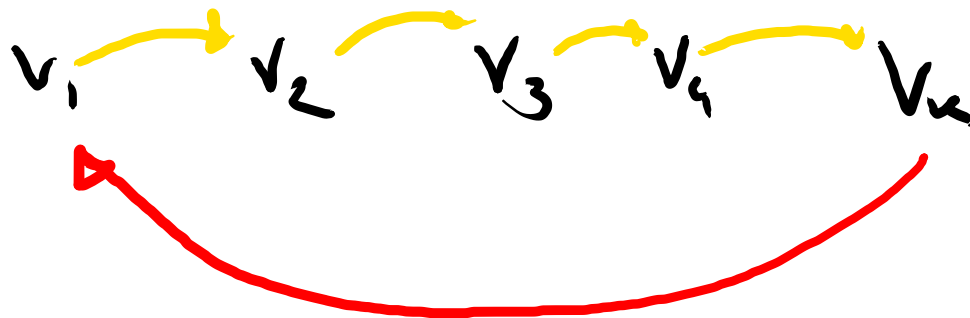
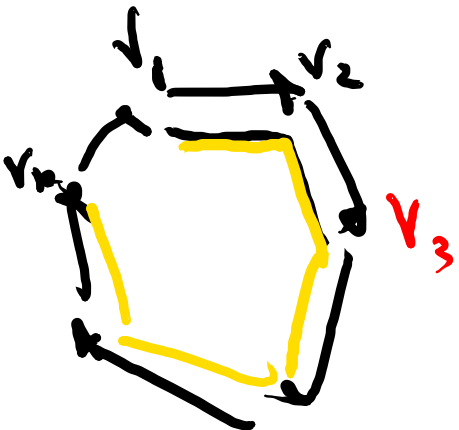


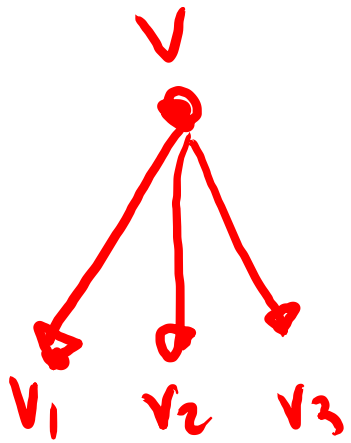
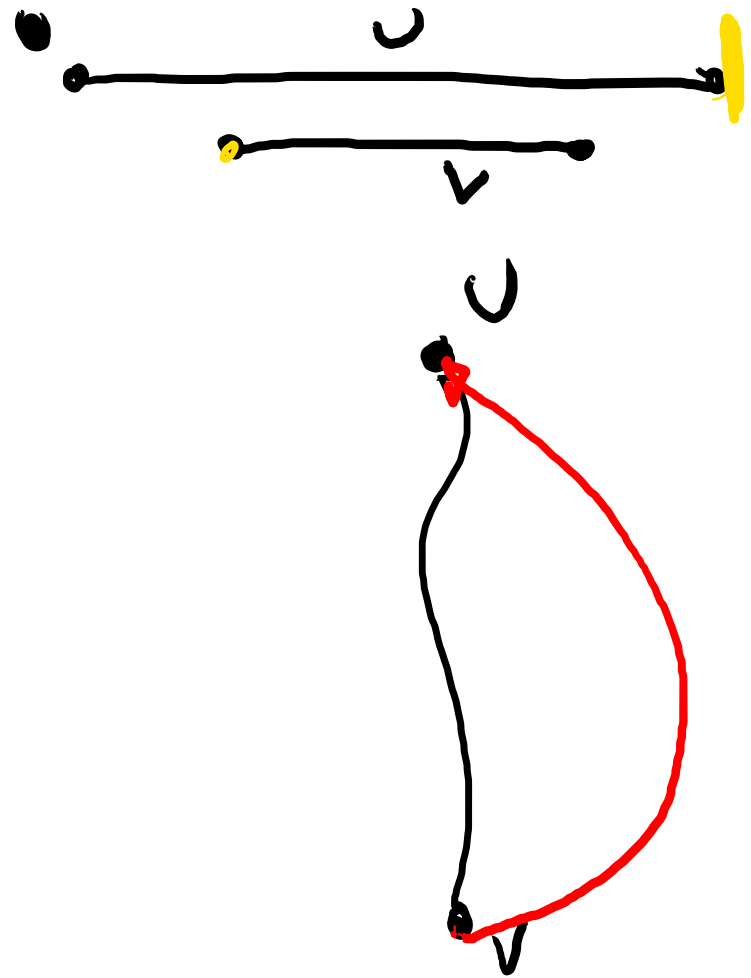
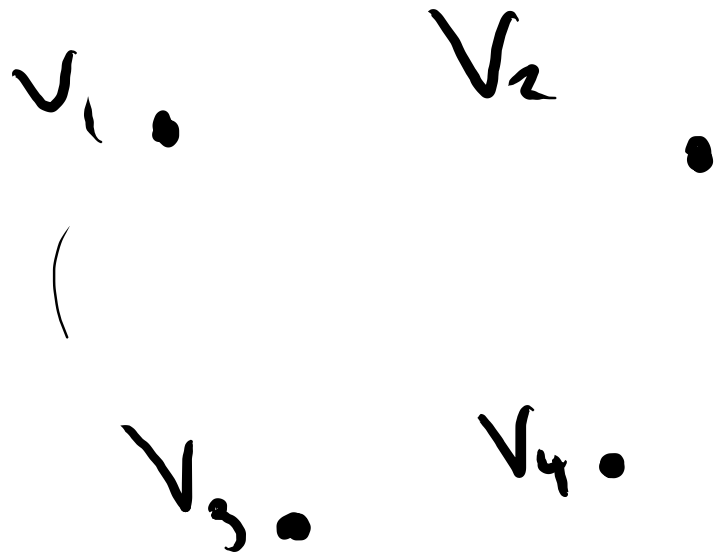
$$\sigma(v) \rightarrow 1, \dots, n$$

$$\forall v \in V(G) \quad \sigma(v) \in \{1, \dots, n\}$$

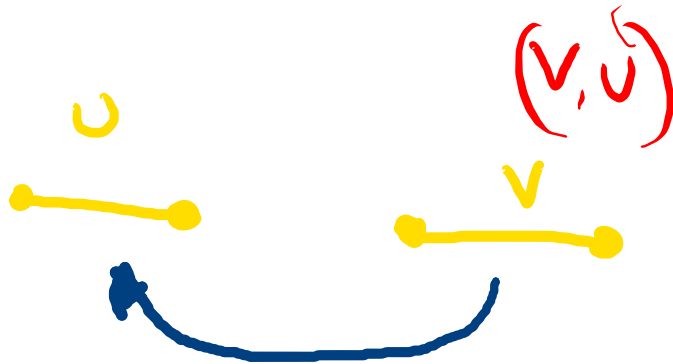
$$\forall v, w \quad \sigma(v) \neq \sigma(w) \quad n = |V|$$

$v_1, v_2, v_3, \dots, v_n$

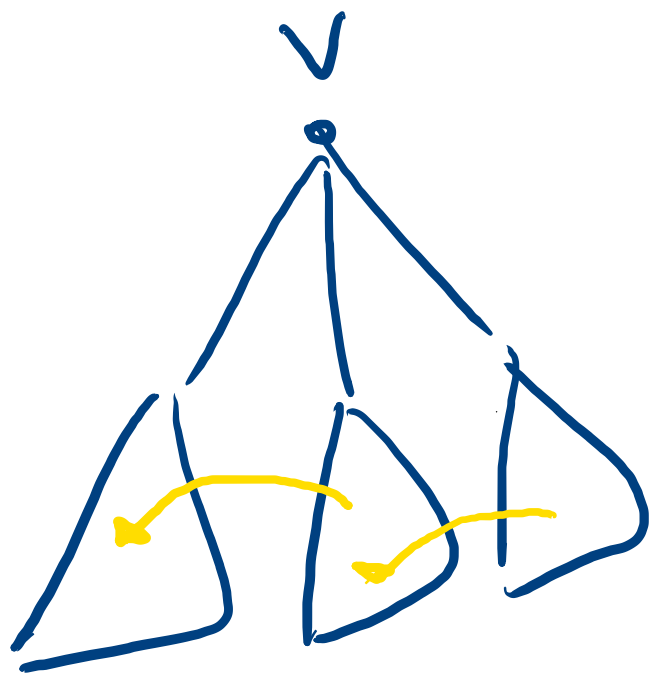
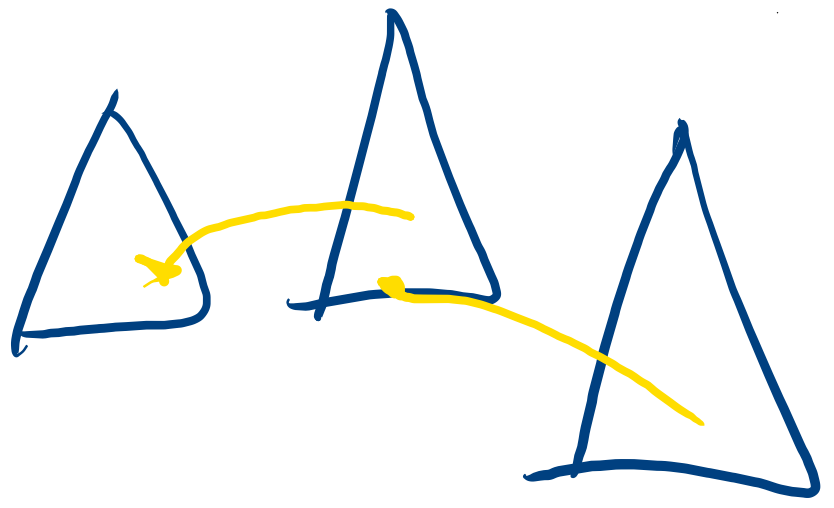
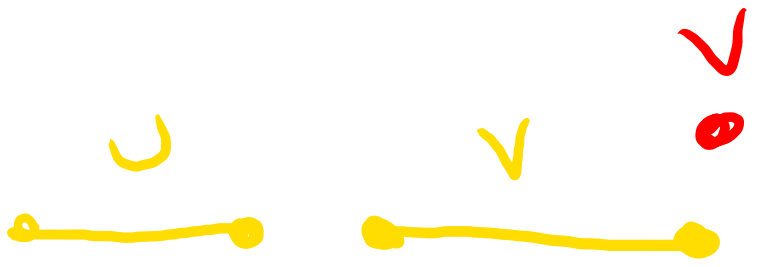


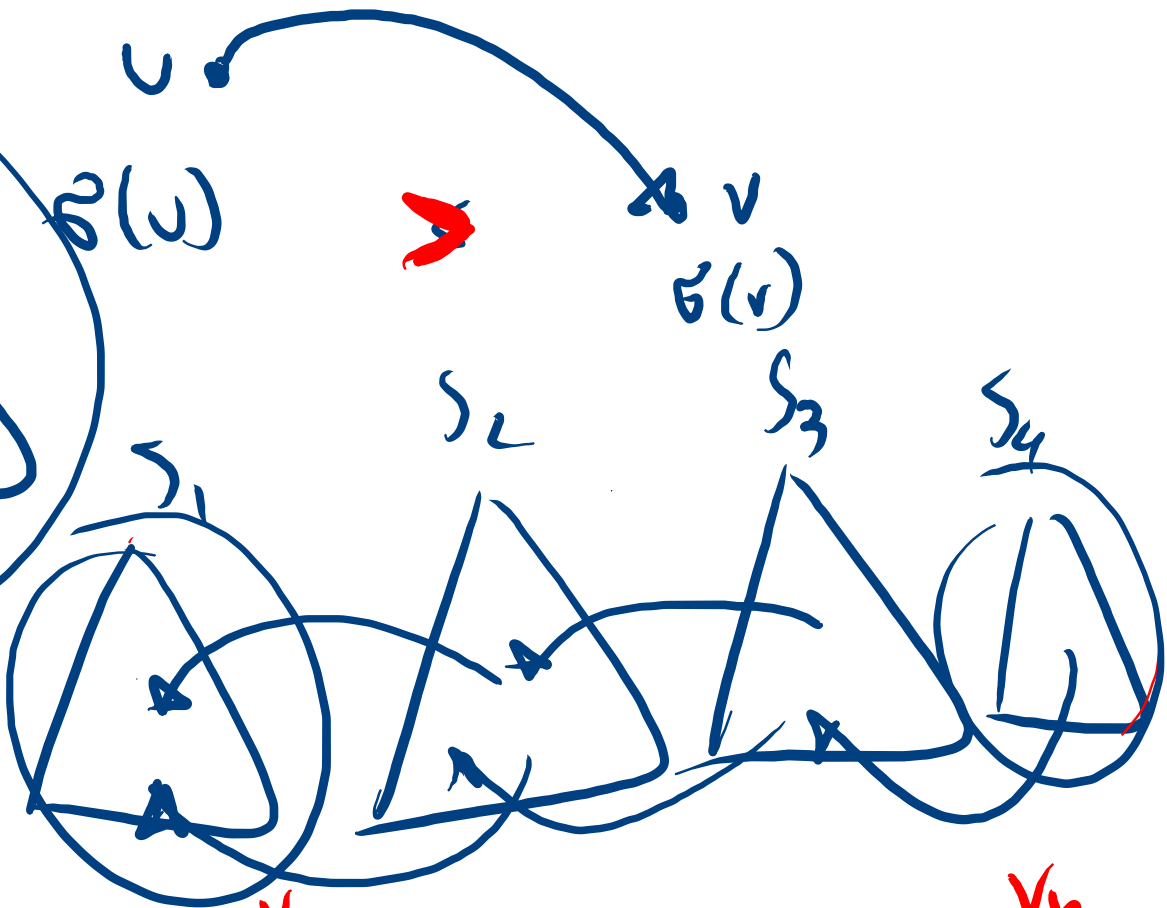


$v_2 v_1 v_2 v_3$

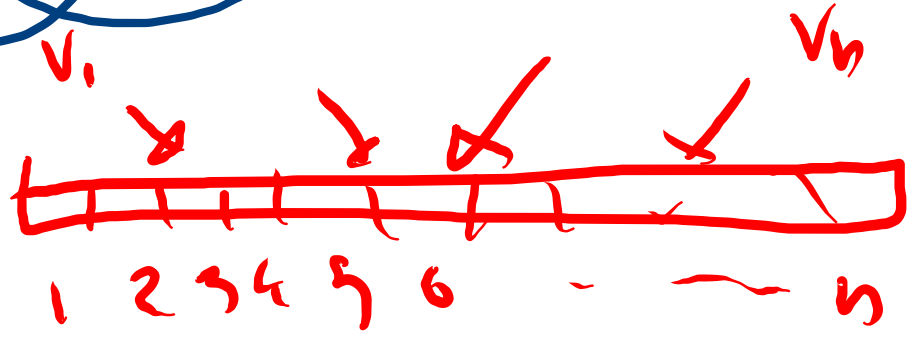


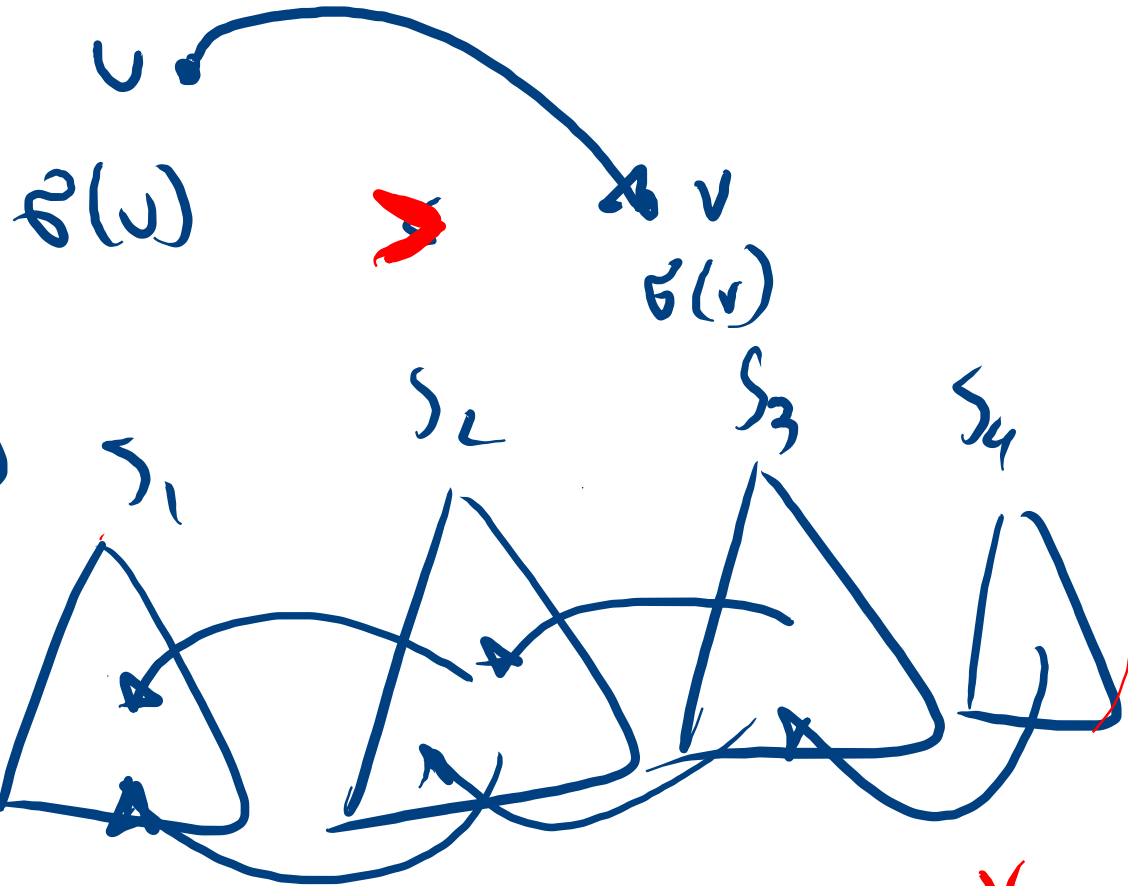
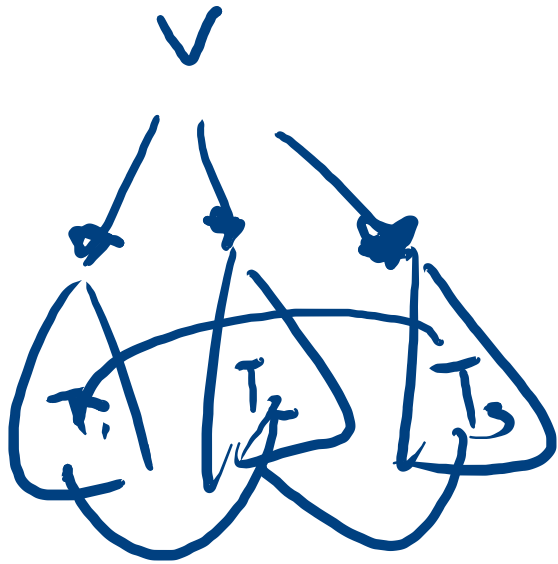
(v, u)



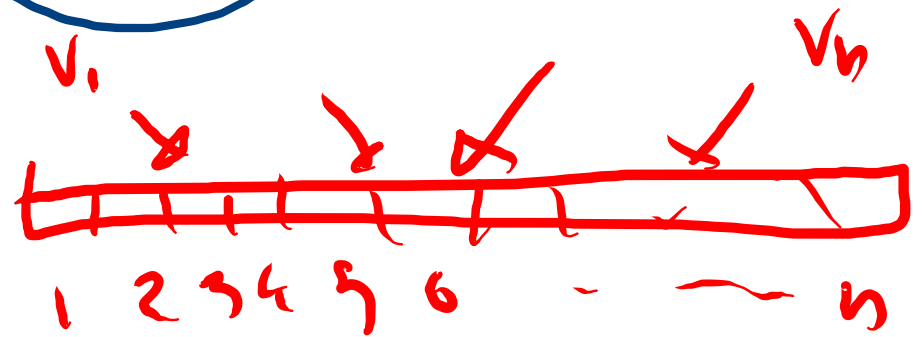


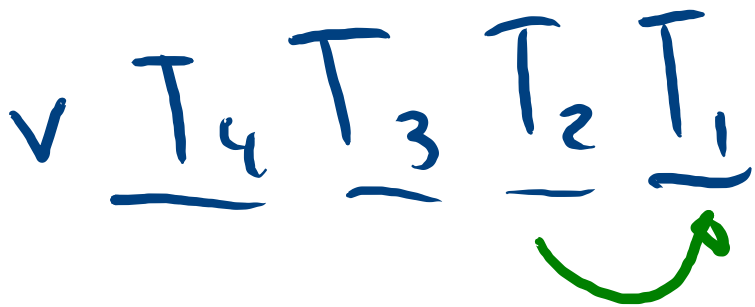
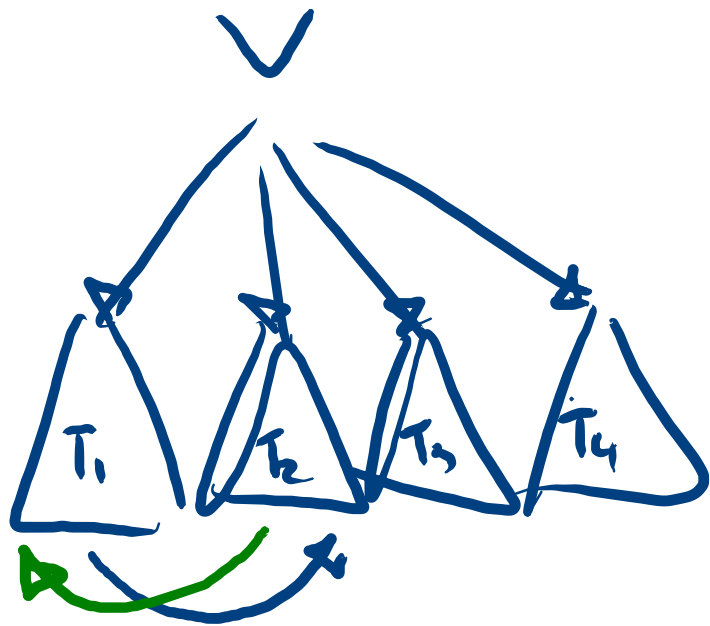
v
 T_3 T_2 T_1





$S_4 \quad S_3 \quad S_2 \quad S_1$





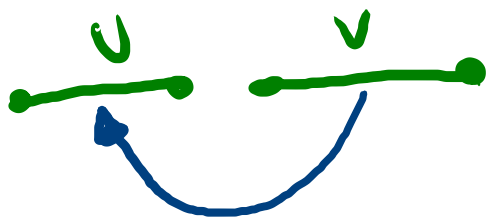
u, v

$fme[v] > fme[u]$

①



②



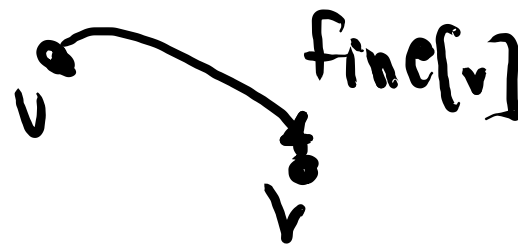
$fme[v] > fme[u]$



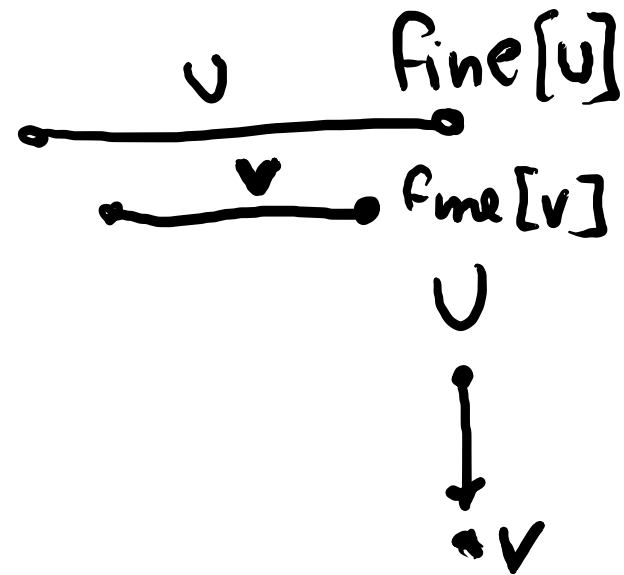
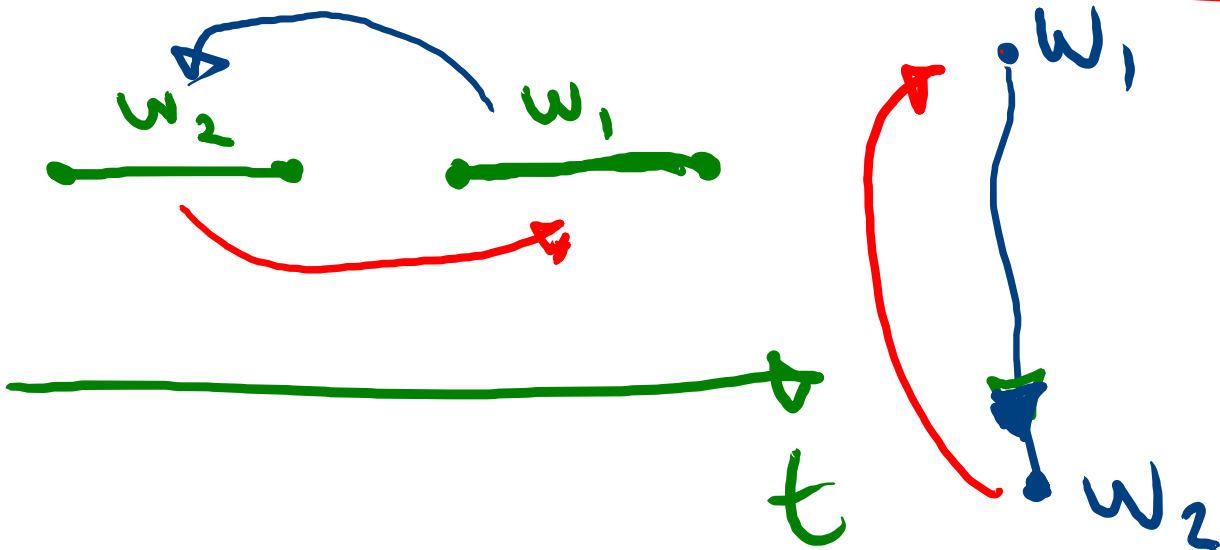
ORDINAMO IN MODO DECRESCENTE

$fine[v]$

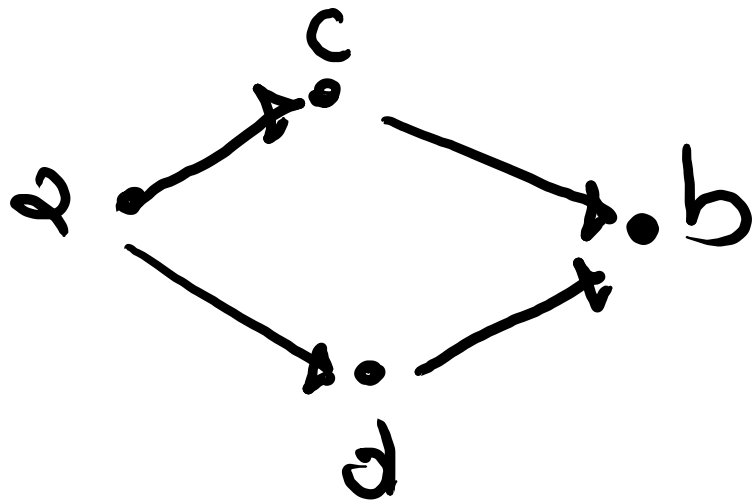
$fine[u]$



$fine[v_1] > fine[v_2] > fine[v_3] > \dots > fine[v_n]$



Es.



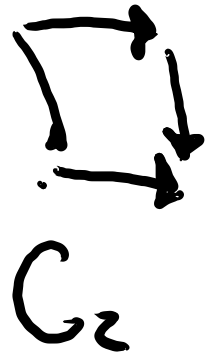
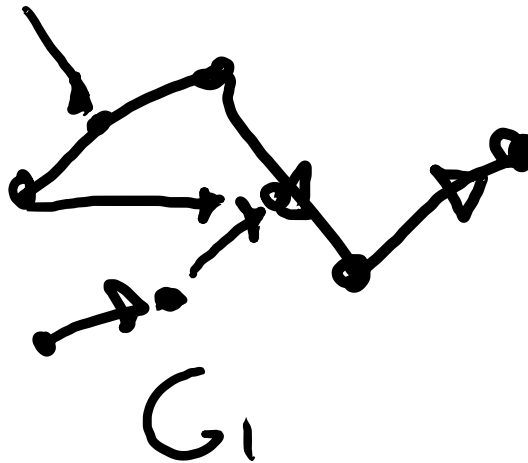
G_1

G_2

• a c d b

$$G = G_1 \cup G_2$$

• a d c b

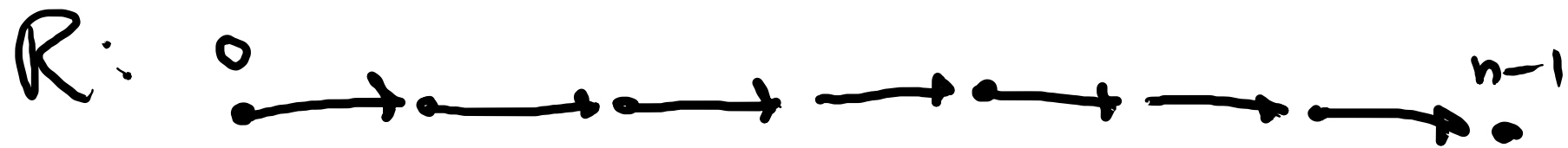


G_1 G_2

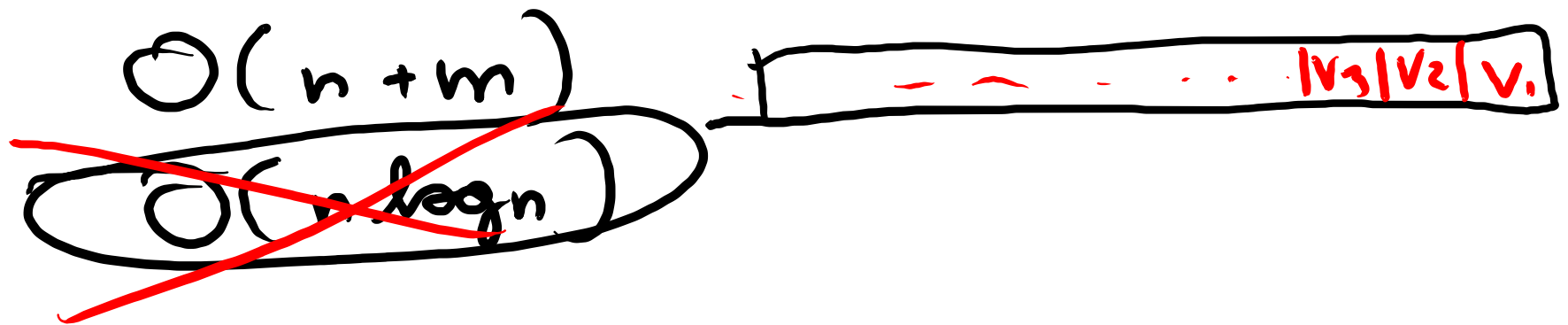
G_1 G_2

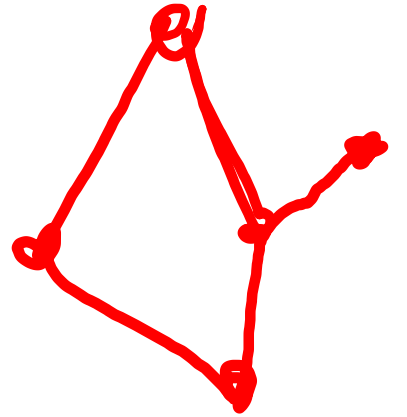
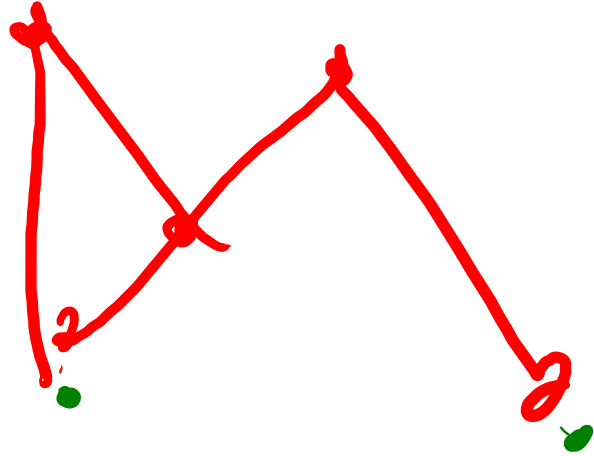
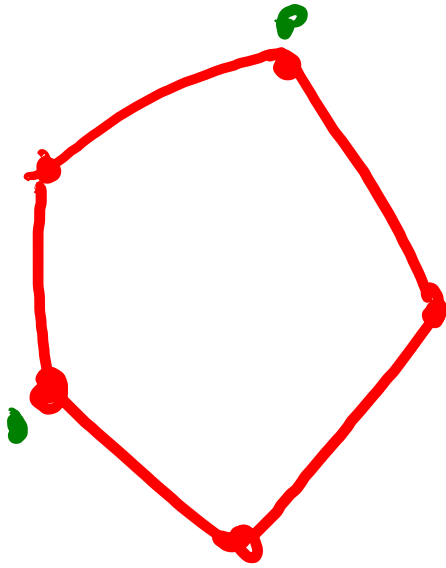
G_2 G_1

Q: n vertici qual è il min # archi
perché esista un solo ord. topologico?



- DFS(G) G ha n vertici e m archi
- ORDINA RISPETTO A fine fine





DFS(G)

fine [---]

$v_1 - \dots - v_n$

$\text{fine}[v_i] > \text{fine}[v_j]$

$\sigma(v_i) < \sigma(v_j)$

- Nessuna violazione di archi

→ ORDINAMENTO TOPOLOGICO

- Una violazione → ARCO BACKWARD

↓ G ha un ciclo

↓ Nessun Ord Top.
Possibile