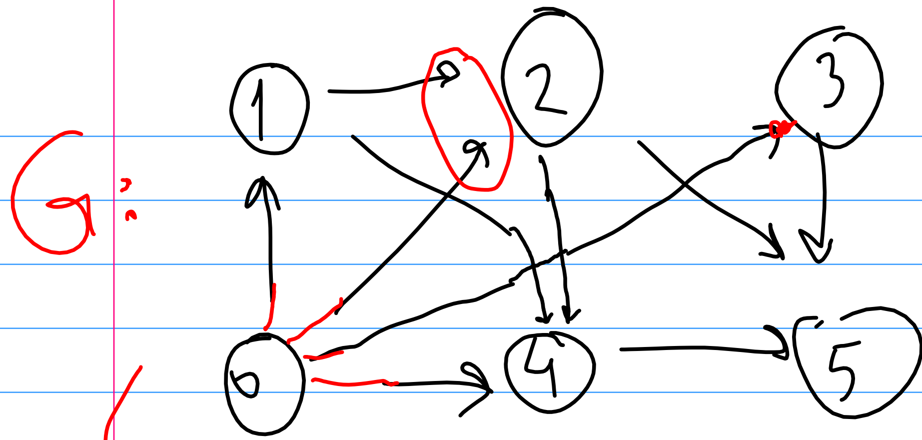
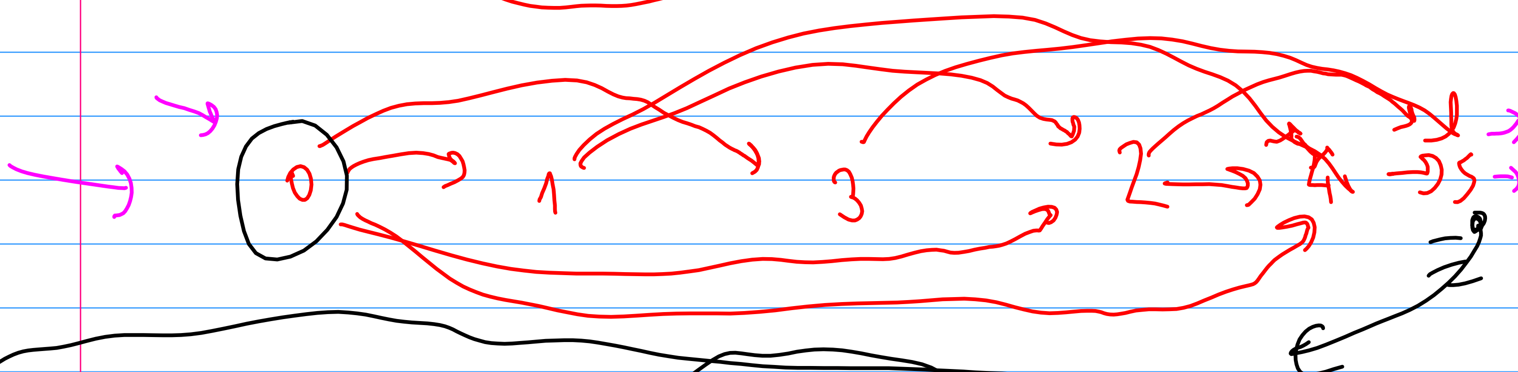


$(0,3) \in E$

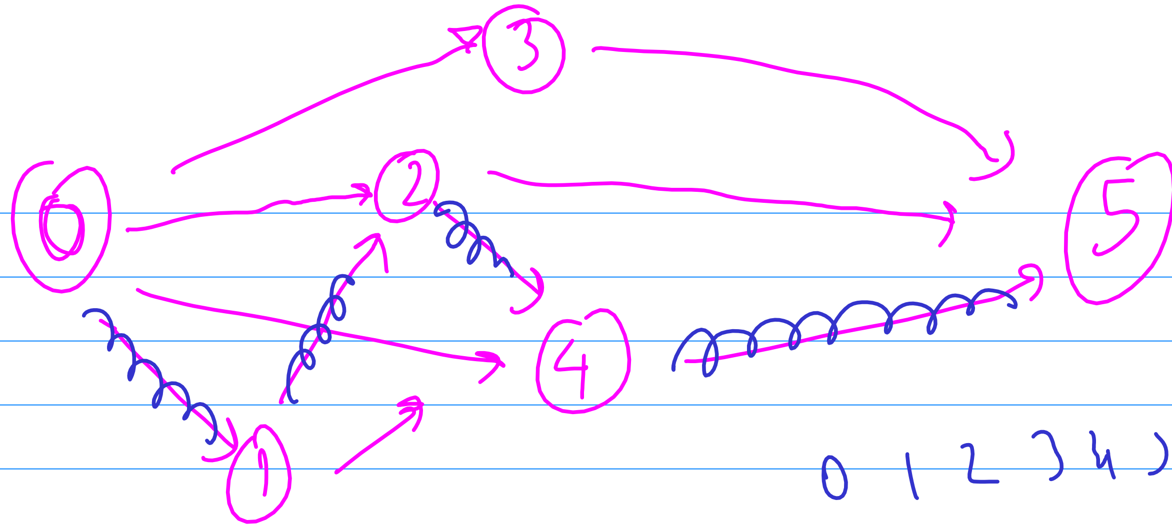
Thm. If $\exists$ cycle in a graph a top. ord is imp.

G has a topological order.



Thm. $1+2+3+\dots+n = \dfrac{n(n+1)}{2}$

Thm. For a Graph $G=(V,E)$ if $\forall v \in V$ $d_{\substack{in\\out}}(v) > 0$, there has to be a cycle therefore G can't have a top. order.



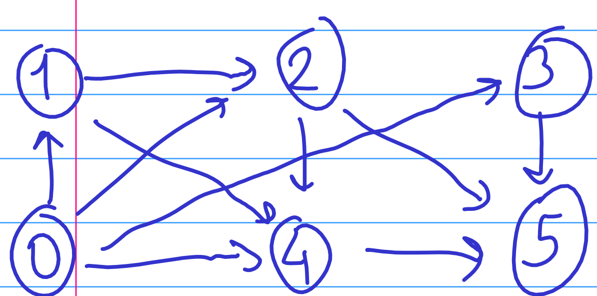
0 1 2 3 4 5

→ 0 × 1 × 2 3 4 × 5

There can be 4 different top. orders

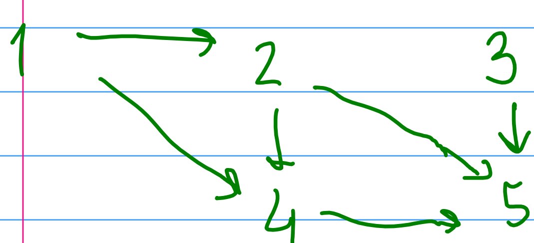
t.o. ⇒ 0 3 1 2 4 5

1 2 3 4 5 6



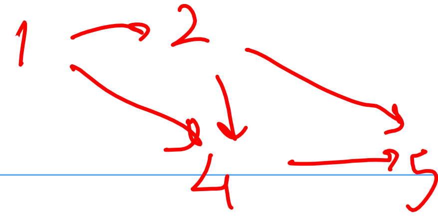
$G^0 = G$

$v = 0$



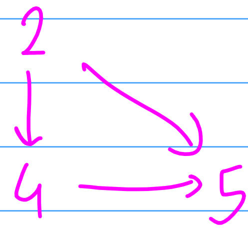
G^1

$v = 3$



G^2

$v = \underline{1}$



G^3

$v = \underline{2}$

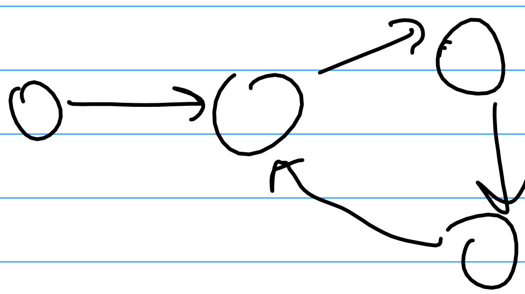
$4 \longrightarrow 5$ $\quad G^4$

$v = 4$

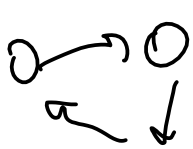
5 $\quad G^5$

$v = 5$

empty $= G^6$

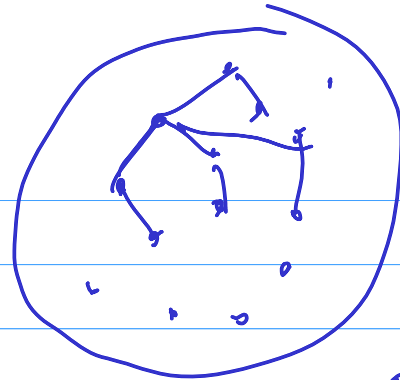


G^0



G^1

n vert. m edges

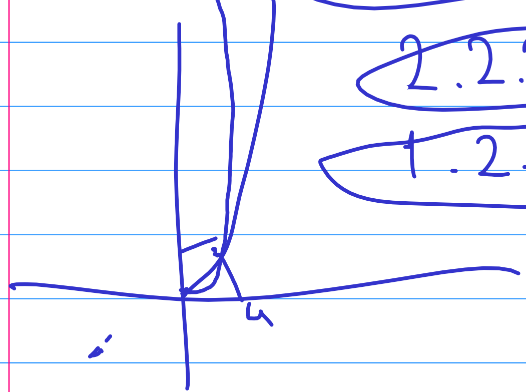


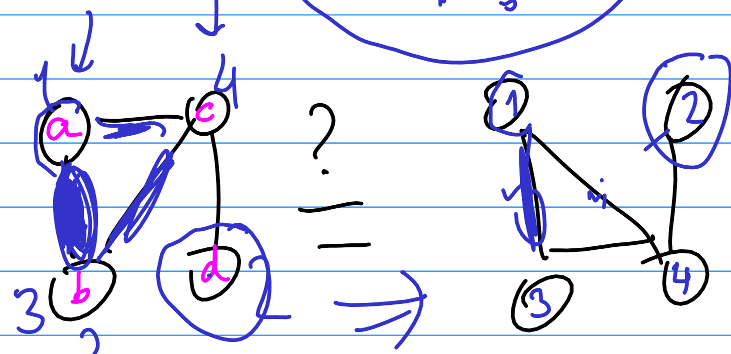
$O(n!\, m)$

$\forall n \geq 4, \quad n! > 2^n$

2.2.2

1.2.3.3.4





6I

a = 1
b = 2
c = 3
d = 4

a-c → 1-3 ✓

a-b 1-2 ✗

n!

a,b,c,d

1,3,4,2

(a,b,c,d)

(1,2,3,4)

(1,2,4,3)

(1,3,2,4)

3,1,4,2

4!