

NB: ( ) ) ) ( ) )  
 1 0 -1 -2 -1 -2 -3

( = +1  
 ) = -1

B: ( ( ) ) ( )  
 1 2 1 0 1 0

2 conditions for balanced:  
 Non-negative prefix-sums  
 Total sum == 0

Solution: Try everything!!!! kinda

$$O(N! \cdot N)$$

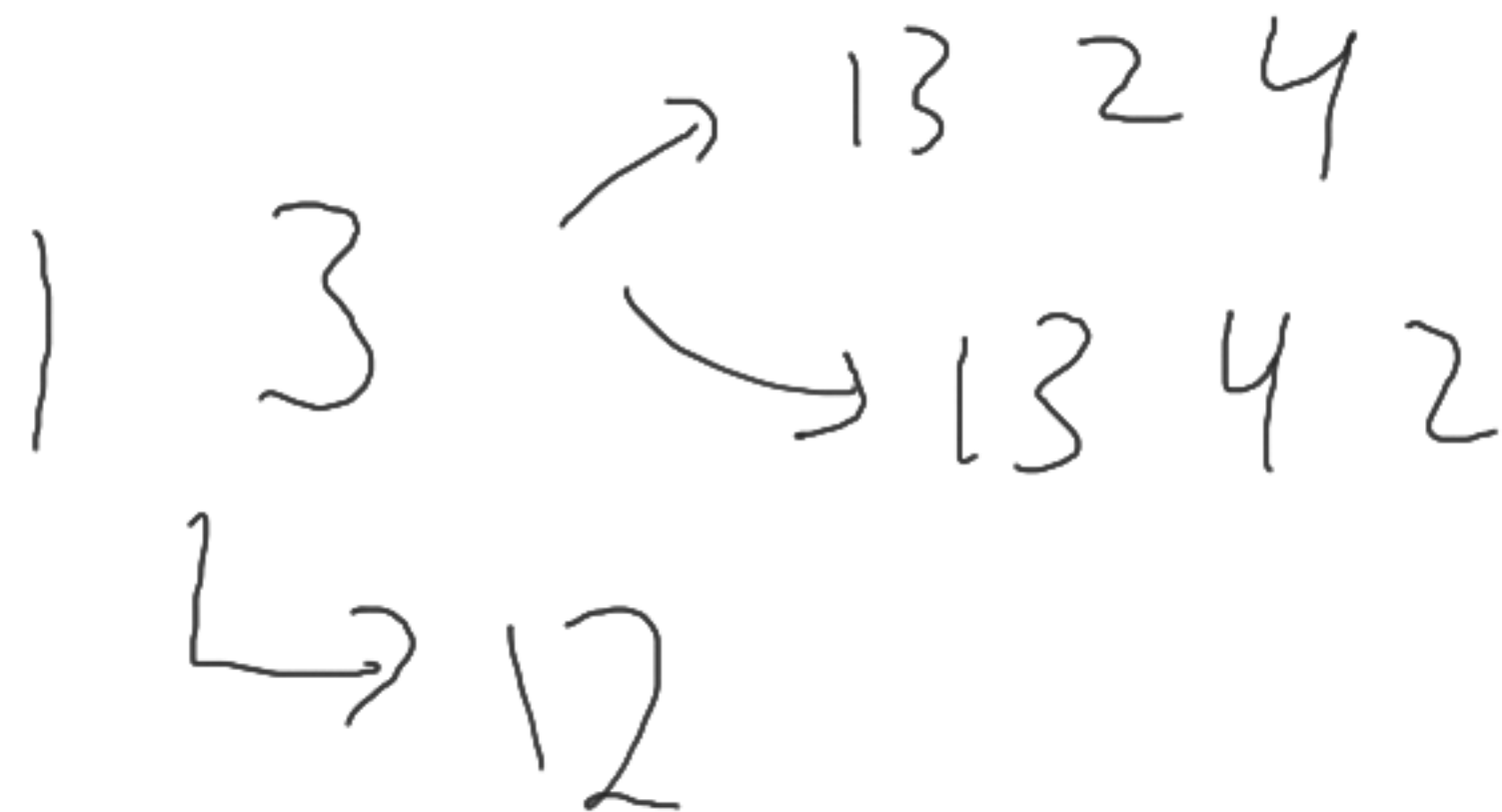
possibilities



$$N = 4$$

$$1 \quad 2 \quad 3 \quad 4$$

$2 \times 10$




$((()))$   
H H H H

$((()))$   
G H G H  
↙ ↘  
 $()$   $()$   
G H

$((()))$   
GG HH  
↙  
 $(($   $)$   
G H

G H

$DP[i][j][k]$  = number of ways to use the first  $i$  with  $j$  unmatched parentheses assigned to G's and  $k$  unmatched parentheses assigned to H's

+ 1 + 1 - 1  
  
 1 2 1

$i = 3$

$j = 1$

$k = 0$

+ 1 + 1



$i = 2$

$j = 2$

$k = 0$



$i = 4$

$j = 0$

$k = 0$

$k = \text{prefixsum}[i] - j$

Case 1: Assign to G

( ( ) )

$i = 4$

$j = 0$

$k = 0$

$i = 3$

$j = 1$

$k = 0$

if  $S_{i+1} = '('$

$DP[i+1][j-1][k] += DP[i][j][k]$

$DP[i+1][j][k-1] += DP[i][j][k]$

Case 2: Assign to H

$i = 4$

$j = 1$

$k = -1$

if  $S_{i+1} = '('$

$DP[i+1][j][k+1] += DP[i][j][k]$

$DP[i+1][j+1][k] += DP[i][j][k]$

( ( ) )

$$i = 4$$

$$j = 0$$

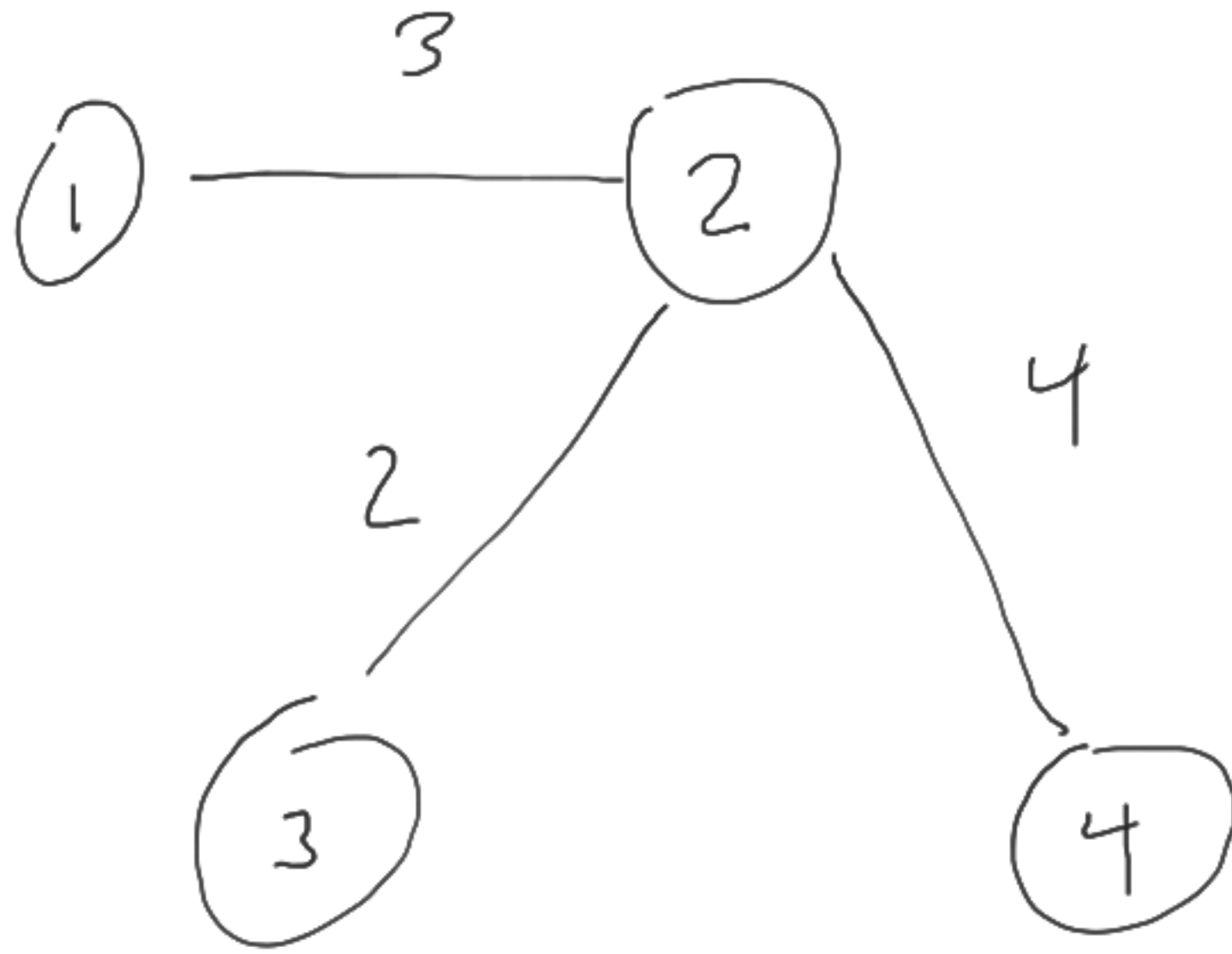
$$k = 0$$

$$DP[6][0][0] = 1$$

$$DP[N][0][0]$$

$$DP[i][A][B] \text{ where } \min(A, B) < 0 \rightarrow 0$$

if an edge can be used with  $K = B$   
 where  $B > A$ , then the edge can be used  
 for  $K = A$ .  $E > B > A \Rightarrow E > A$



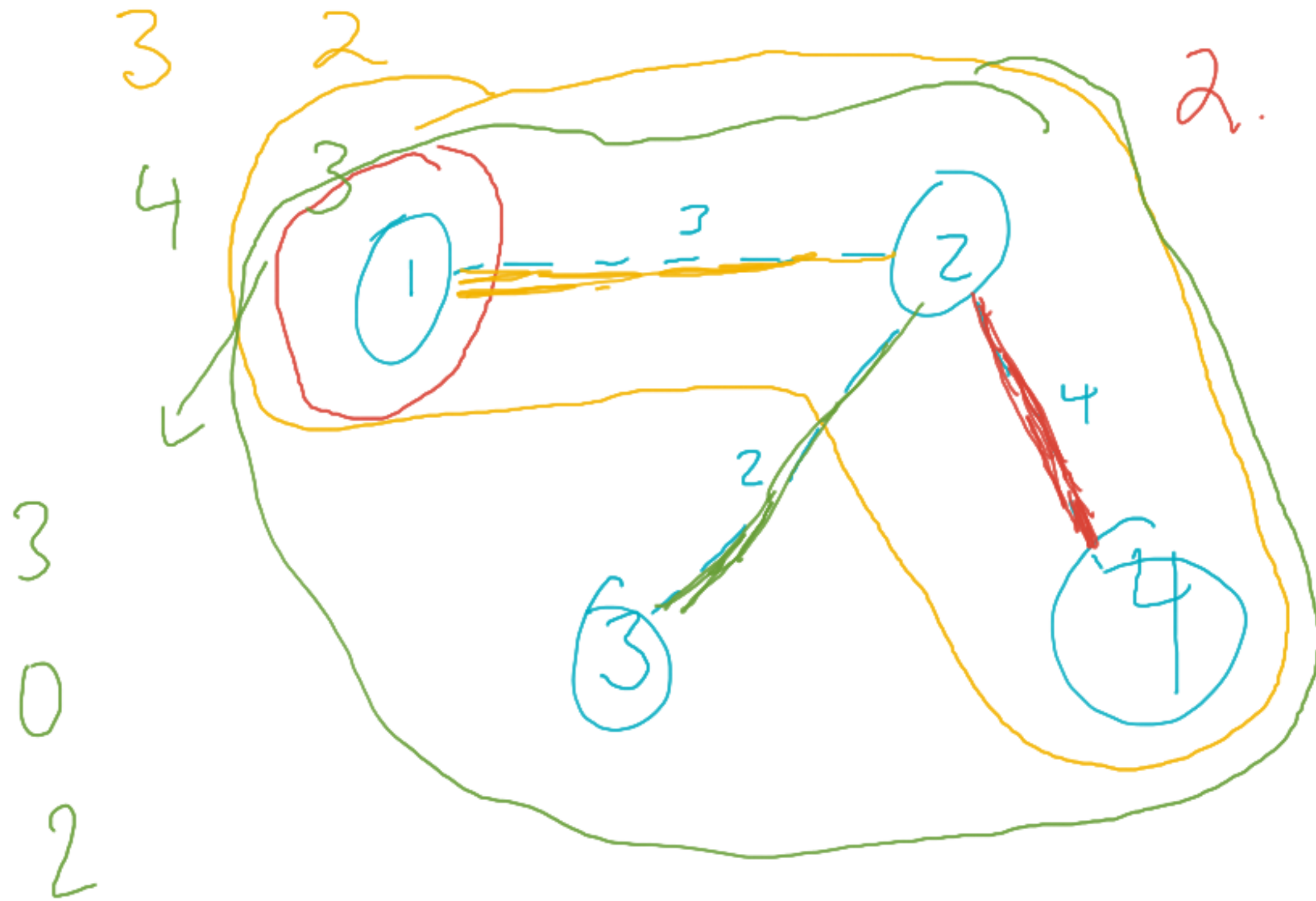
$k_i$	$V_i$	
1	2	$\rightarrow 3$
4	1	$\rightarrow 0$
3	1	$\rightarrow 2$

Naive

Runtime

$O(n^2)$

ind	k	v	size	ans
1	4	1	1	0
2	3	1	3	2
0	1	2	4	



1. Activate all edges  
→ with relevance  $\geq k$

2. Answer the query  
by finding the  
size of the  
component  
containing  $V$   
→ also subtract  
1