Z PREDNÁŠKY

↳ TSP 2-APPROX

↳ $c(T) \leq c(H^*)$ - COST OF MIN. SPANNING TREE ≤ OPT. HAMILTONIAN PATH

↳ $c(W) = 2 * c(T)$ - FULL WALK W TRAVERSES ∀ EDGE TWICE

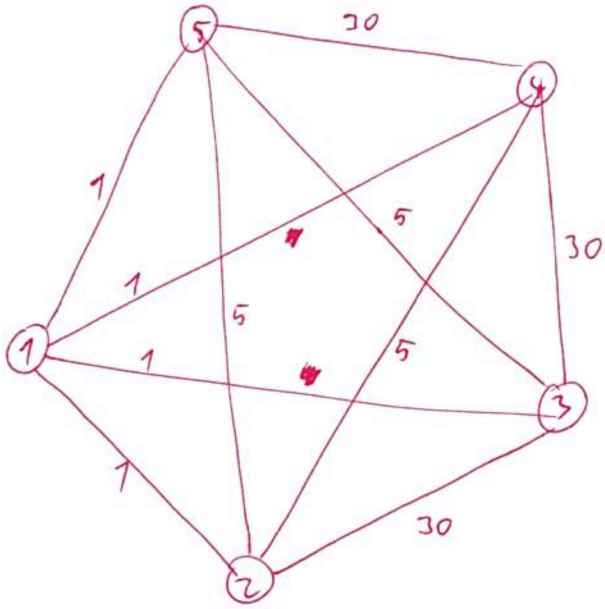
↳ $c(H) \leq c(W)$ - OUR HAM. PATH FROM REMOVING SOME V FROM W + TRIANGLE INEQUALITY

$$\Downarrow$$

$$c(H) \leq 2c(H^*)$$

BEZ TRIANGLE INEQUALITY

GRAF S $c(H) \gg 2c(H^*)$



$c(H)$ FROM 1 = 1 - 2 - 3 - 4 - 5 - 1 = 1 + 30 + 30 + 30 + 1 = 92

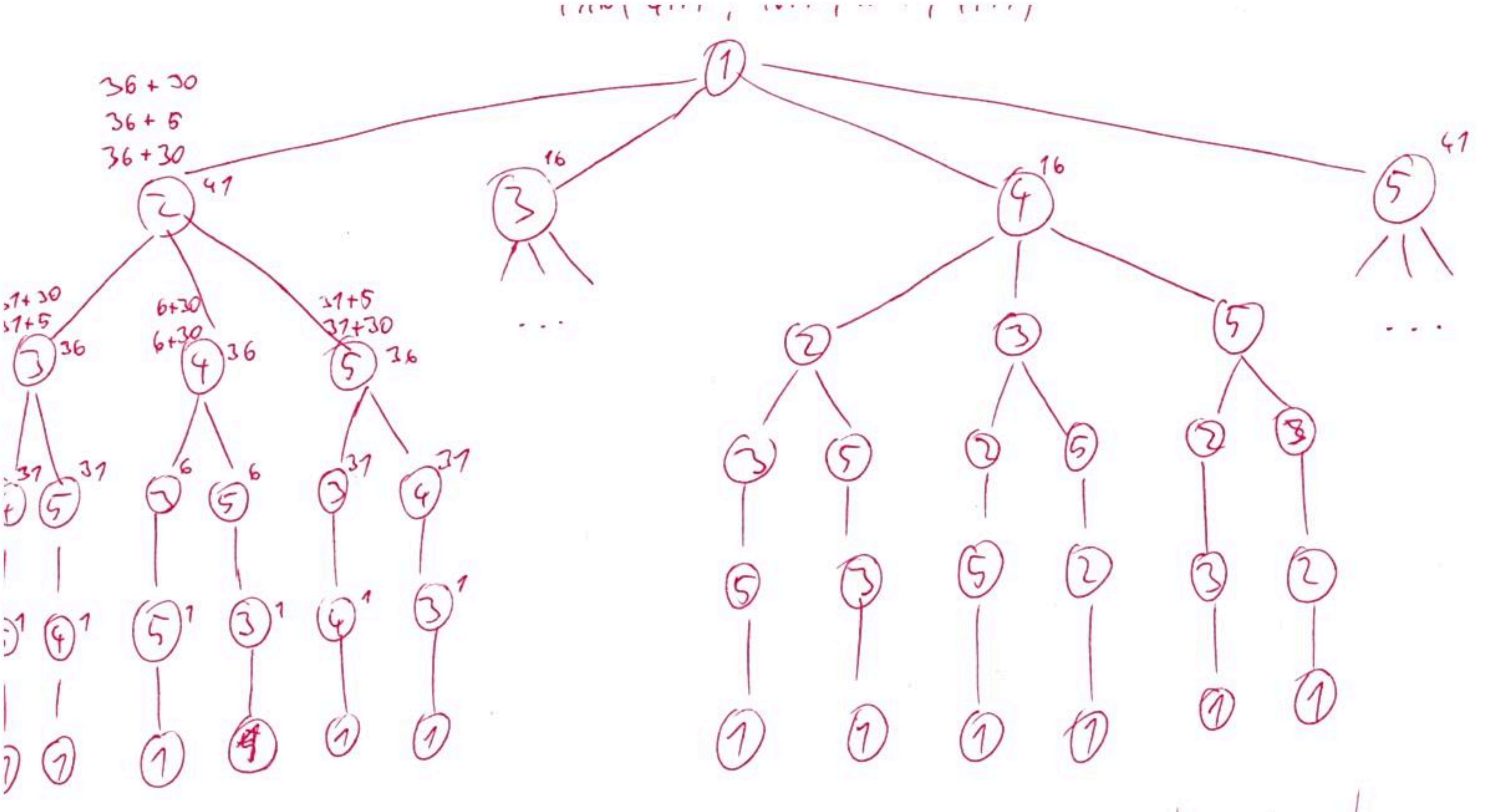
$c(H)$ FROM 2 = 2 - 1 - 3 - 4 - 5 - 2 = 1 + 1 + 30 + 30 + 5 = 67

$c(H)$ FROM 3 = 3 - 1 - 4 - 5 - 2 - 3 = 1 + 1 + 30 + 5 + 30 = 67

$c(H^*)$ FROM 1 = 1 - 3 - 5 - 2 - 4 - 1 = 1 + 5 + 5 + 5 + 1 = 17

- STÁLE BY SME CHCELI TSP RIEŠIŤ :(

  ↳ DÁ SA ASPOŇ PRE MALÉ n? → BACKTRACK



D	1	2	3	4	5
1	-	1	1	1	1
2	1	-	30	5	~~30~~ 5
3	1	30	-	30	5
4	1	5	30	-	30
5	1	~~30~~ 5	5	30	-

↳ ČAS : $O(n!)$

↳ DÁ SA LEPŠIE?

BELLMAN-HELD-KARP

↳ PODPROBLÉM

↳ $COST(x_i, S)$

x_i - VRCHOL GRAFU

S - SET VRCHOLOV, KT. OSTÁVAJÚ NA ZVÁŽENIE

↳ PODPROBLÉMY - VZŤAH

$$COST(x_i, S) = \min_{x_j \in S} \left(COST(x_j, S \setminus \{x_j\}) + D_{ij} \right)$$

↳ BASE CASE

IF $|S| = 1$:

$COST(x_i, S) = D_{i1}$

↳ START

$COST(x_1, V \setminus \{x_1\})$

COMPARISON $O(n!)$ vs. $O(n^2 \cdot 2^n)$

$O(100!) \sim O(10^{157})$

$O(100^2 \cdot 2^{100}) \sim O(10^{34})$

TIME COMPLEXITY

$O(2^n)$ ↳ ZVAŽUJEME VŠETKY SUBSETY $V \setminus \{x_1\}$

↳ 2^{n-1}

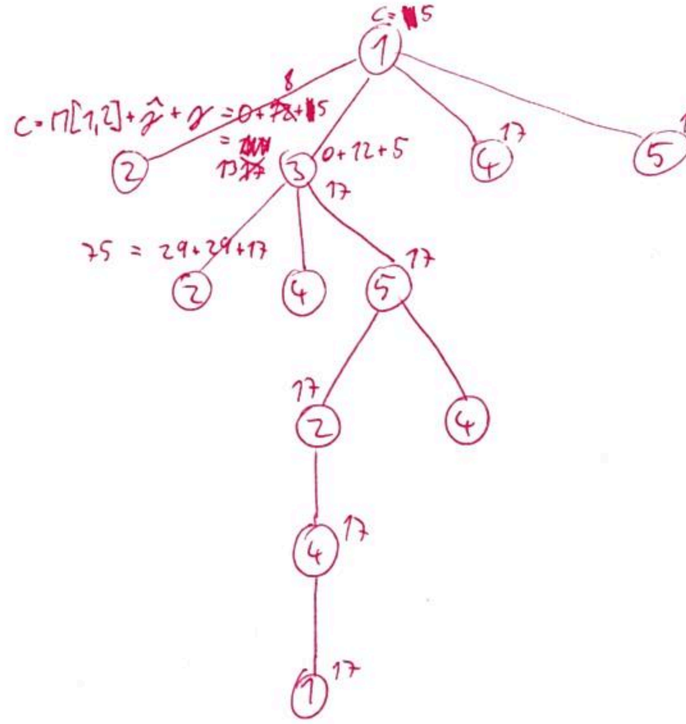
$O(n)$ ↳ PRE KAŽDÝ $\leq n$ SPÚŠTAME COST FUNKCIU

$O(n)$ ↳ PRE KAŽDÚ COST BERIEME MINIMUM Z $\leq n$ HODNÔT

↳ $O(n^2 \cdot 2^n)$

TSP WITH BRANCH AND BOUND

UB = ∞



SET ROW 1 = ∞
SET COL 2 = ∞
SET M[2,1] = ∞
~~REDUCE~~
$\hat{\gamma}$ = REDUCE(M)

D	1	2	3	4	5
1	-	1	1	1	1
2	1	-	30	5	~~30~~ 5
3	1	30	-	30	5
4	1	5	30	-	30
5	1	~~30~~ 5	5	30	-

REDUCED D

M	1	2	3	4	5	
1	-	0	0	0	0	1
2	0	-	29	4	~~29~~ 4	1
3	0	29	-	29	4	1
4	0	4	29	-	29	1
5	0	~~29~~ 4	4	29	-	1
	0	0	0	0	0	

$C = M[Z, DO] + C[Z] + COST\_OF\_REDUCTION$

REDUCED COST γ = ~~1~~5

	1	2	3	4	5	
1	-	-	-	-	-	
2	-	-	29	4	~~29~~ 4	4
3	0	-	-	29	4	0
4	0	-	29	-	29	0
5	0	-	4	29	-	0
	0		4	0	0	

$\hat{\gamma}$ = ~~13~~ 8