DAA

By Awitesh

Unit - 1

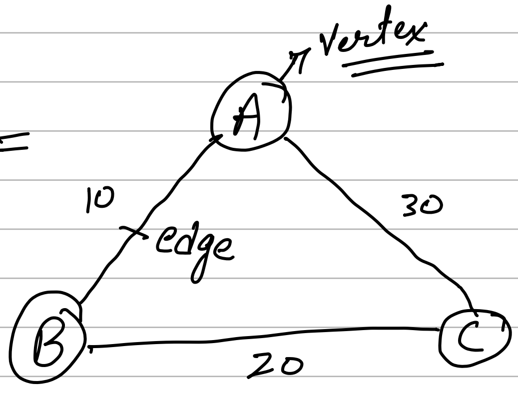
★ Algorithm

- Finite no. of steps to solve a problem is called Algorithm
-

Unit 2

Spaning Tree

G =

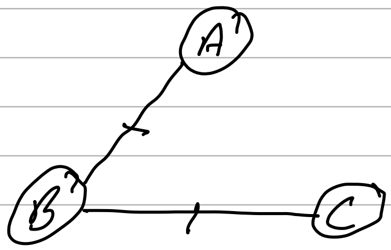


n = 3 no. of vertex in graph (G)

n^{n-2} = no. of possible Spanning Tree

n-1

no. of edges in spaning Tree



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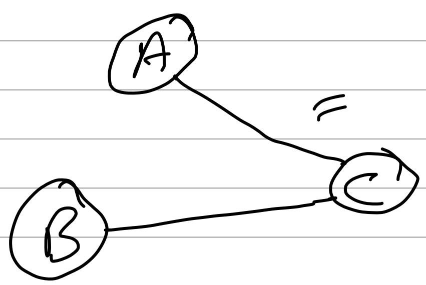
$3^1 = 3$



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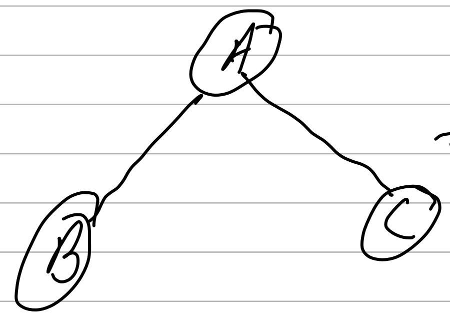

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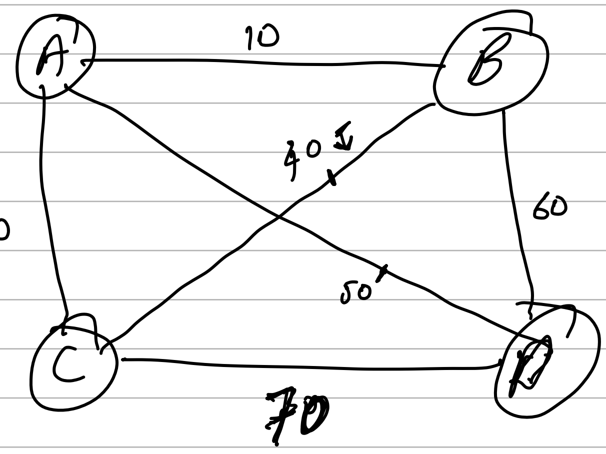
G =



n-1

= 3

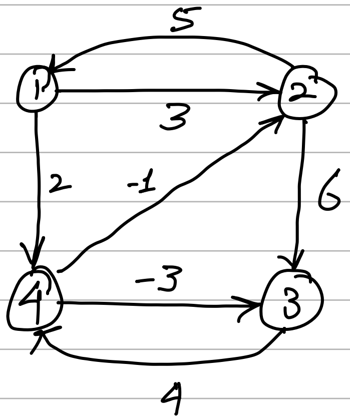
n^{n-2}

$4^2 = 16$

Unit - 4

Floyd Warshall Algorithm. (All pair shortest path)

$$D^0 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & 2 \\ 5 & 0 & 6 & \infty \\ \infty & \infty & 0 & 4 \\ \infty & -1 & -3 & 0 \end{bmatrix} \end{array}$$



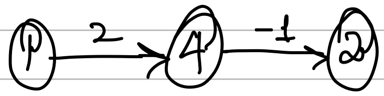
$$D^1 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & 2 \\ 5 & 0 & 6 & 7 \\ \infty & \infty & 0 & 4 \\ \infty & -1 & -3 & 0 \end{bmatrix} \end{array}$$

As it is

$$D^2 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & 9 & 2 \\ 5 & 0 & 6 & 7 \\ \infty & \infty & 0 & 4 \\ 4 & -1 & -3 & 0 \end{bmatrix} \end{array}$$

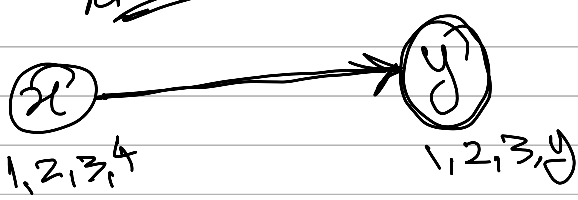
$$D^3 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & 9 & 2 \\ 5 & 0 & 6 & 7 \\ \infty & \infty & 0 & 4 \\ 4 & -1 & -3 & 0 \end{bmatrix} \end{array}$$

$$D^4 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 1 & -1 & 2 \\ 5 & 0 & 4 & 7 \\ 8 & 3 & 0 & 4 \\ 4 & -1 & -3 & 0 \end{bmatrix} \end{array}$$



$2+(-1)=1$

Ans



0/1 Knapsack Problem using Dynamic Programing

Object	1	2	3	4
Profit	1	4	5	7
Weight	1	3	4	5

$\boxed{M = 7}$ → Bag Capacity

$$KS(n,w) = \begin{cases} 0 & \text{if } n=0 \text{ OR } w=0 \\ \max\begin{cases} KS(n-1, W-Wt[n]) + P[n] \\ KS(n-1, W) \end{cases} & \\ & \text{if } wt[n] > W \end{cases}$$

Object	wt	P	w=0	w=1	w=2	w=3	w=4	w=5	w=6	w=7
n=0	0	0	0	0	0	0	0	0	0	0
n=1	1	1	0	1	1	1	1	1	1	1
n=2	3	4	0	1	1	4	5	5	5	5
n=3	4	5	0	1	1	4	5	6	6	9
n=4	5	7	0	1	1	4	5	7	8	9

Increase

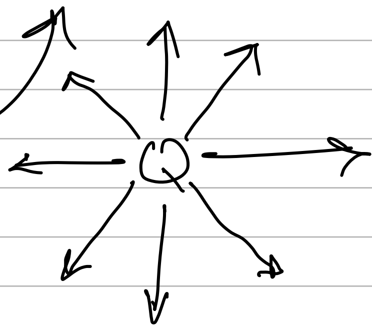
Answer Maximum Profit

1	2	3	4
0	1	1	0
×	↑	↑	×

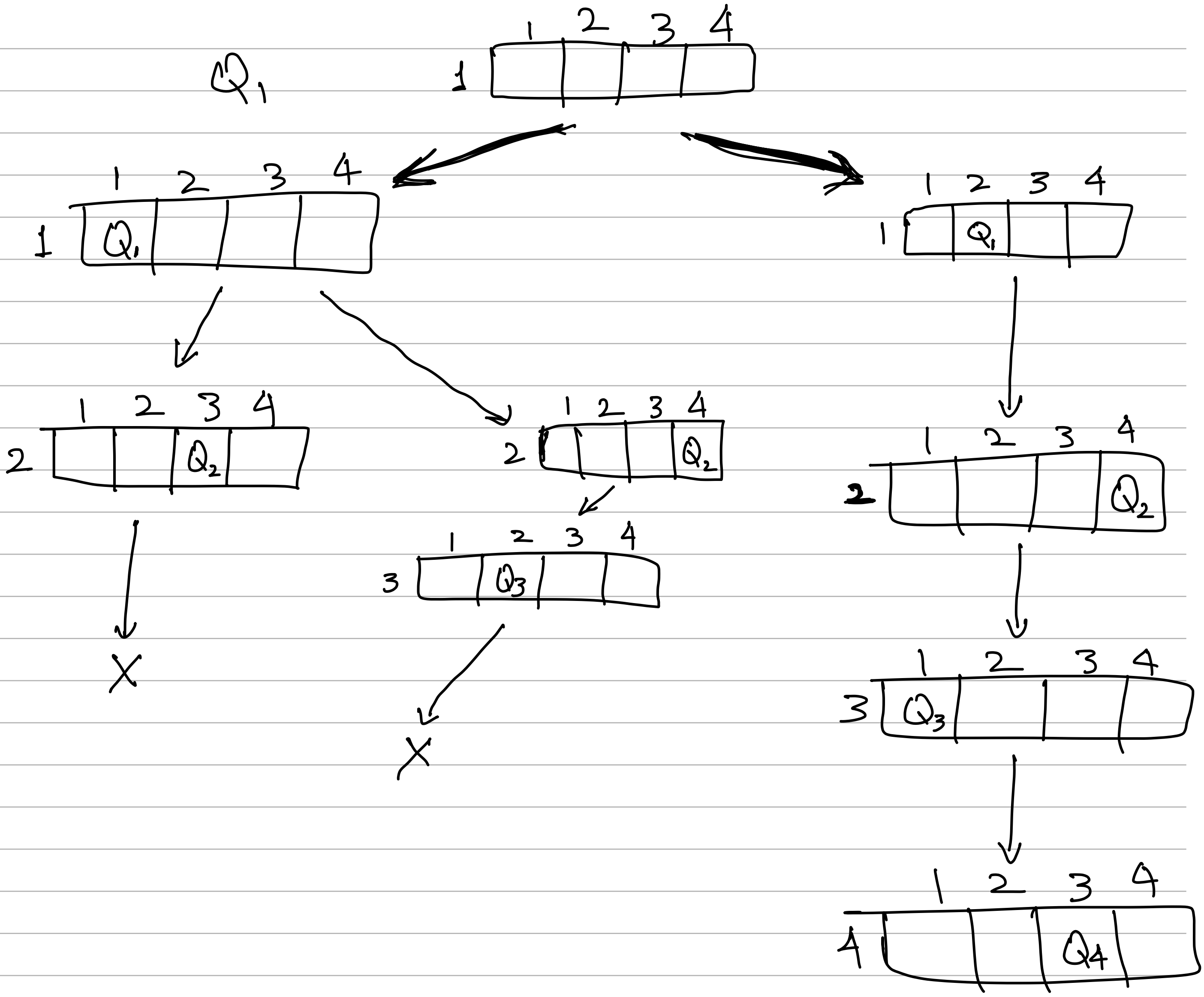
N-Queen Problem (n=4)

Q_1
Q_2
Q_3
Q_4

	1	2	3	4
1				
2				
3				
4				



	1	2	3	4
1		Q_1		
2				Q_2
3	Q_3			
4			Q_4	



Ans

Therefore

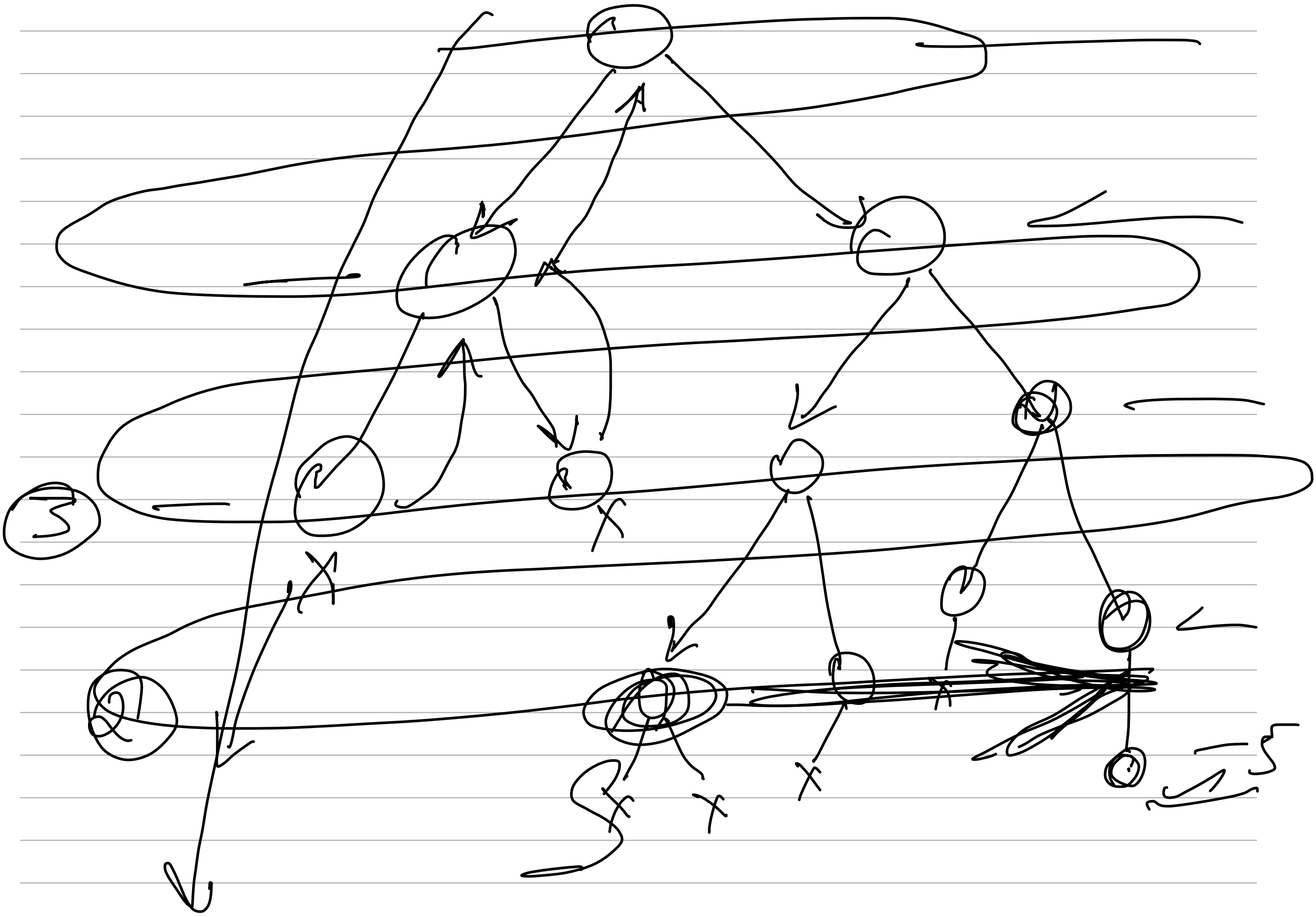
	1	2	3	4
1		Q_1		
2				Q_2
3	Q_3			
4			Q_4	

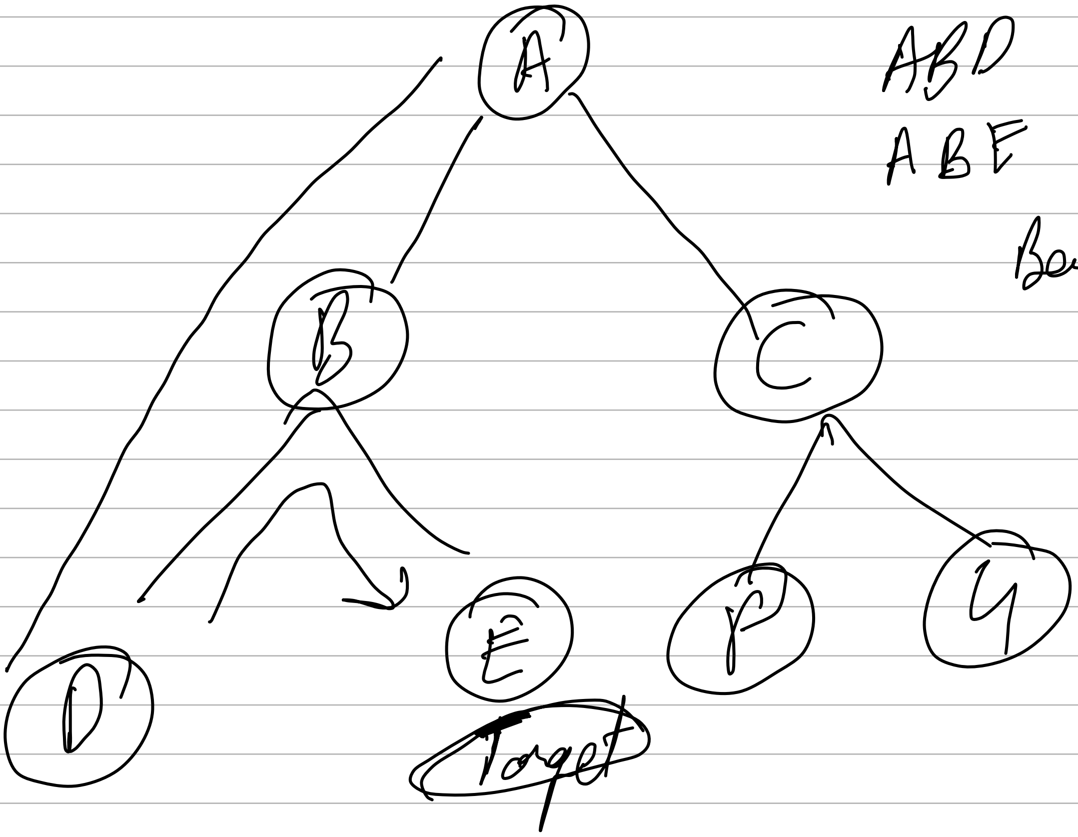
Traveling S.M. } Branch & Bound.

n-queen

Sum of Subset
Hamiltonian cycle } Backtracking

Gate Hub है !



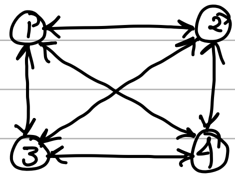


ABD
ABE

Back

$$TSP(1,\{2,3,4\}) = \min \begin{cases} c(1,2) + TSP(2,\{3,4\}) \\ c(1,3) + TSP(3,\{2,4\}) \\ c(1,4) + TSP(4,\{2,3\}) \end{cases}$$

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array}\begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 6 & 1 & 3 \\ 4 & 0 & 2 & 1 \\ 1 & 2 & 0 & 8 \\ 3 & 1 & 7 & 0 \end{bmatrix} \end{array}$$



$TSP(1, \{2,3,4\})$ — 15, 7, 7

- $c(1,2) + TSP(2,\{3,4\})$ — 6 — 13, 9
  - $c(2,3) + TSP(3,\{4\})$ — 2, $\underbrace{\{4\}}_{11}$
    - $c(3,4) + TSP(4,\{\phi\})$ — 8
      - $c(4,1)$ — 3
  - $c(2,4) + TSP(4,\{3\})$ — 1, $\underbrace{\{3\}}_{8}$
    - $c(4,3) + TSP(3,\{\phi\})$ — 7
      - $c(3,1)$ — 1
- $c(1,3) + TSP(3,\{2,4\})$ — 1 — 6, 13
  - $c(3,2) + TSP(2,\{4\})$ — 2, $\underbrace{\{4\}}_{4}$
    - $c(2,4) + TSP(4,\{\phi\})$ — 1
      - $c(4,1)$ — 3
  - $c(3,4) + TSP(4,\{2\})$ — 8, $\underbrace{\{2\}}_{5}$
    - $c(4,2) + TSP(2,\{\phi\})$ — 1
      - $c(2,1)$ — 4
- $TSP(1,4) + TSP(4,\{2,3\})$ — 3 — 4, 13
  - $c(4,2) + TSP(2,\{3\})$ — 1, $\underbrace{\{3\}}_{3}$
    - $c(2,3) + TSP(3,\{\phi\})$ — 2
      - $c(3,1)$ — 1
  - $c(4,3) + TSP(3,\{2\})$ — 7, $\underbrace{\{2\}}_{6}$
    - $c(3,2) + TSP(2,\{\phi\})$ — 2
      - $c(2,1)$ — 4

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array}\begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 6 & 1 & 3 \\ 4 & 0 & 2 & 1 \\ 1 & 2 & 0 & 8 \\ 3 & 1 & 7 & 0 \end{bmatrix} \end{array}$$

$1 \to 3 \to 2 \to 4 \to 1$

$1 \to 4 \to 2 \to 3 \to 1$

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