Exercise 1 Find the shortest path in the two following networks from node 0 to node 4, using Dijkstra and Bellman-Ford algorithms. Indicate the shortest path tree and the negative cycle, if it exists.

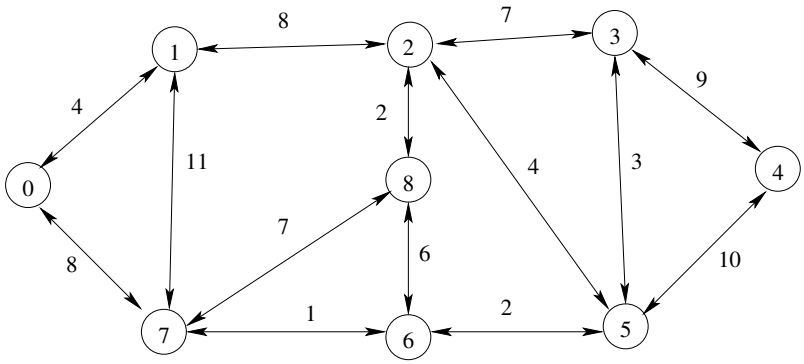


Figure 1 – Network 1

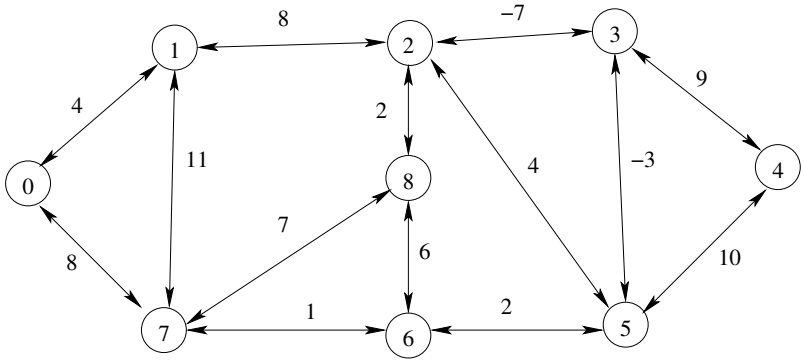


Figure 2 – Network 2

Gonna use Dijkstra for ① and Bellman-Ford for ②

↳ PAGE 3

Exercise 2 Find the all-pairs shortest path in the following network, using the algorithm of Floyd-Warshall. Draw the resulting reachability graph.

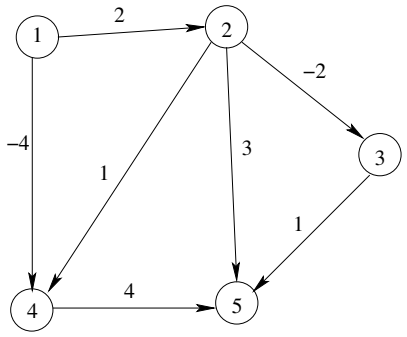
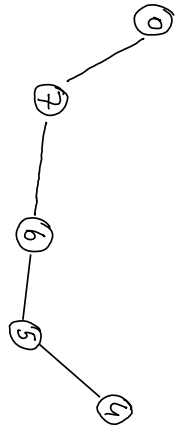


Figure 3 – Network 3

Exercise 3 Read the problem *A joint vacation problem!* in EA2025_PL in Mooshak and solve it using the techniques discussed above.

11.1

Dijkstra

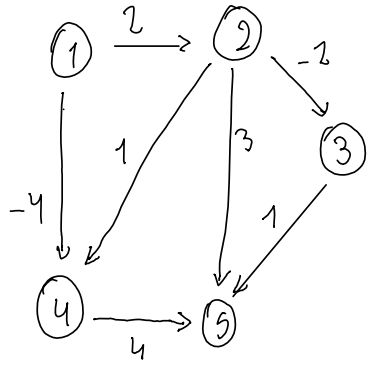


0: 0 ✓
1: ~~∞~~ 4(0) ✓
2: ~~∞~~ 12(1) ✓
3: ~~∞~~ 14(5) ✓
4: ~~∞~~ 21(5) ✓
5: ~~∞~~ 11(6) ✓
6: ~~∞~~ 9(7) ✓
7: ~~∞~~ 8(0) ✓
8: ~~∞~~ ~~15(7)~~ 14(2) ✓

11.2 Bellman-Ford at most 8 steps

0: 0 −1(7)
1: ∞ 4(0) −2(7)
2: ∞ ~~12(1)~~ ~~−2(3)~~ −16(3)
3: ∞ 5(2) ~~−7(5)~~ ~~−9(2)~~ −15(5)
4: ∞ ~~14(3)~~ 12(5) ~~0(3)~~ −2(5)
5: ∞ ~~16(2)~~ ~~2(3)~~ −12(3)
6: ∞ 4(5) −10(5)
7: ∞ ~~8(0)~~ 5(6) −9(6)
8: ∞ 14(2) ~~10(6)~~ ~~0(2)~~ −4(6)

2



$d[i][j] > d[i][k] + d[k][j]$

	1	2	3	4	5
1	0	2	0	-4	5
2		0	-2	1	3
3			0		1
4				0	4
5					0

k → 1 2 3 4 5
i → 1 2 3 4 5
j → 1 2 3 4 5

$d[i][j] > d[i][k] + d[k][j]$

3 2 2 1
3 2 2 2
3 2 2 3
3 2 2 4
3 2 2 5

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parei em k=2, i=4