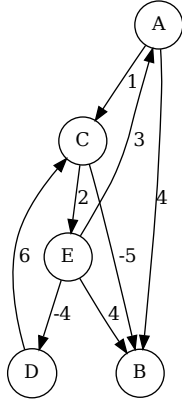


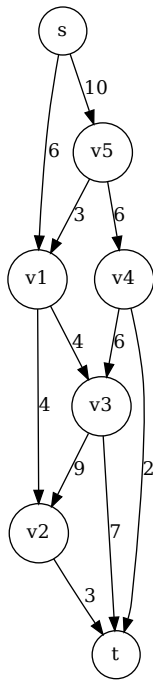
CS5200 Homework 4 Graphs
Adam McNeil
Question 1

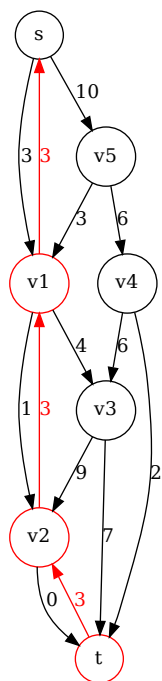


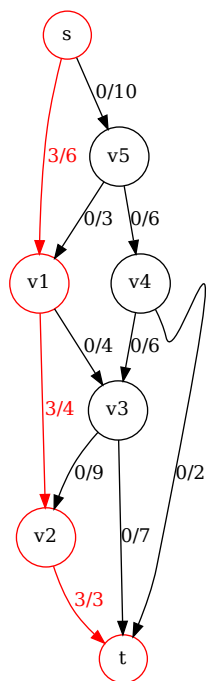
$D(0) =$		A	B	C	D	E	$\pi(0) =$		A	B	C	D	E
	A	0	4	1	∞	∞		A	nil	A	A	nil	nil
	B	∞	0	∞	∞	∞		B	nil	nil	nil	nil	nil
	C	∞	-5	0	∞	2		C	nil	C	nil	nil	C
	D	∞	∞	6	0	∞		D	nil	nil	D	nil	nil
$D(1) =$	E	3	4	∞	-4	0	$\pi(1) =$	E	E	E	nil	E	nil
		A	B	C	D	E			A	B	C	D	E
	A	0	4	1	∞	∞		A	nil	A	A	nil	nil
	B	∞	0	∞	∞	∞		B	nil	nil	nil	nil	nil
	C	∞	-5	0	∞	2		C	nil	C	nil	nil	C
$D(2) =$	D	∞	∞	6	0	∞	$\pi(2) =$	D	nil	nil	D	nil	nil
	E	3	4	4	-4	0		E	E	E	A	E	nil
		A	B	C	D	E			A	B	C	D	E
	A	0	4	1	∞	∞		A	nil	A	A	nil	nil
	B	∞	0	∞	∞	∞		B	nil	nil	nil	nil	nil
$D(3) =$	C	∞	-5	0	∞	2	$\pi(3) =$	C	nil	C	nil	nil	C
	D	∞	∞	6	0	∞		D	nil	nil	D	nil	nil
	E	3	4	4	-4	0		E	E	E	A	E	nil
		A	B	C	D	E			A	B	C	D	E
	A	0	-4	1	∞	3		A	nil	C	A	nil	C
$D(4) =$	B	∞	0	∞	∞	∞	$\pi(4) =$	B	nil	nil	nil	nil	nil
	C	∞	-5	0	∞	2		C	nil	C	nil	nil	C
	D	∞	1	6	0	8		D	nil	C	D	nil	C
	E	3	-1	4	-4	0		E	E	C	A	E	nil
		A	B	C	D	E			A	B	C	D	E

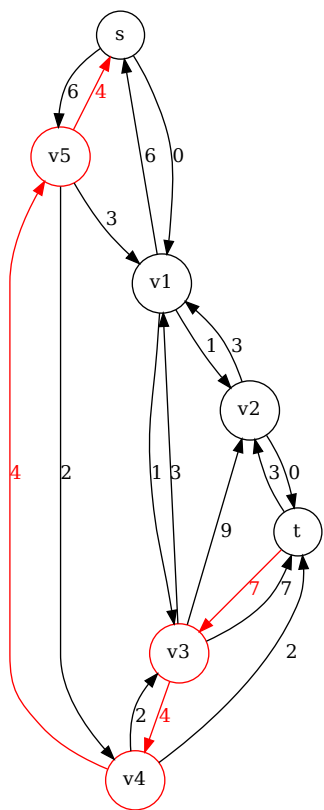
$D(4) =$		A	B	C	D	E	$\pi(4) =$		A	B	C	D	E
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	B	∞	0	∞	∞	∞		B	nil	nil	nil	nil	nil
	C	∞	-5	0	∞	2		C	nil	C	nil	nil	C
	D	∞	1	6	0	8		D	nil	C	D	nil	C
$D(5) =$	E	3	-3	2	-4	0		E	E	D	D	E	nil
		A	B	C	D	E	$\pi(5) =$		A	B	C	D	E
	A	0	-4	1	-1	3		A	nil	C	A	E	C
	B	∞	0	∞	∞	∞		B	nil	nil	nil	nil	nil
	C	5	-5	0	-2	2		C	E	C	nil	E	C
	D	11	1	6	0	8		D	E	C	D	nil	C
	E	3	-3	2	-4	0		E	E	D	D	E	nil

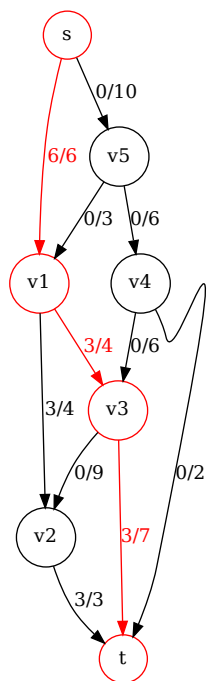
Question 2

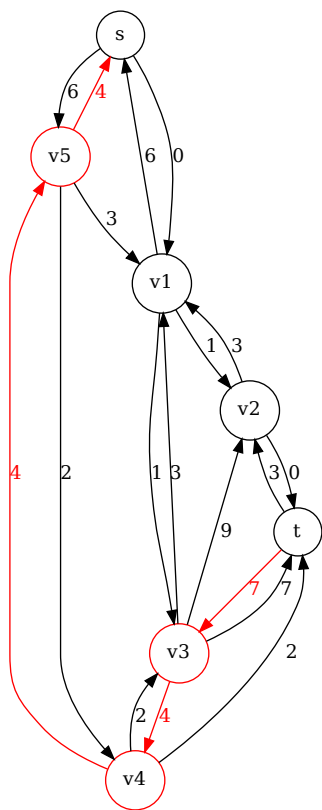


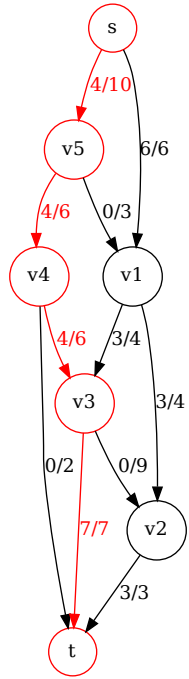


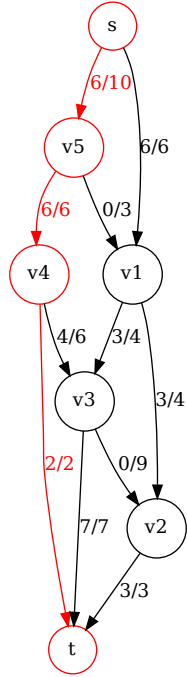












Question 3

Strategy A: 5 different paths are needed until the final answer is reached

- $s \rightarrow v1 \rightarrow v2 \rightarrow t$
- $s \rightarrow v5 \rightarrow v3 \rightarrow t$
- $s \rightarrow v5 \rightarrow v4 \rightarrow t$
- $s \rightarrow v1 \rightarrow v3 \rightarrow t$
- $s \rightarrow v5 \rightarrow v4 \rightarrow v3 \rightarrow t$

Strategy B: 4 different paths are needed until the final answer is reached

- $s \rightarrow v5 \rightarrow v4 \rightarrow v3 \rightarrow t$
- $s \rightarrow v1 \rightarrow v2 \rightarrow t$
- $s \rightarrow v5 \rightarrow v6 \rightarrow v3 \rightarrow v4 \rightarrow t$
- $s \rightarrow v6 \rightarrow v3 \rightarrow t$

Strategy A is always worse or equal to Strategy B.

Question 4

1) For a given cut (S, T), the net flow from S to T can be greater than capacity of S and T.

False

2) For any (S, T) cut, if the net flow equals to the capacity of S and T, then we

cannot find any augmenting path in the residual graph.

True

3) The Floyd-Warshall algorithm belongs to the greedy algorithm, as it is more efficient than the dynamic programming solution.

False

4) The Dijkstra's algorithm can be used to find the all-pairs shortest paths in a weighted directed graph, and it is more efficient than some dynamic programming solution.

True

Bonus: