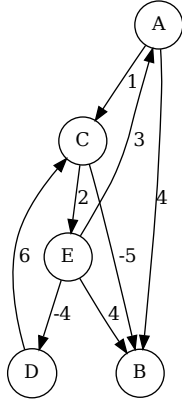
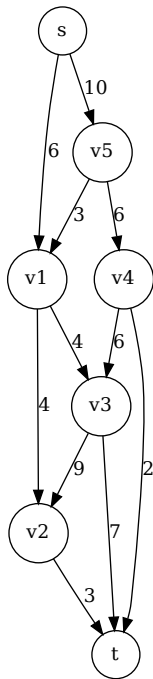


CS5200 Homework 4 Graphs  
Adam McNeil  
Question 1

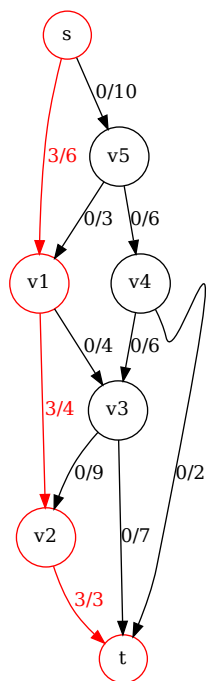


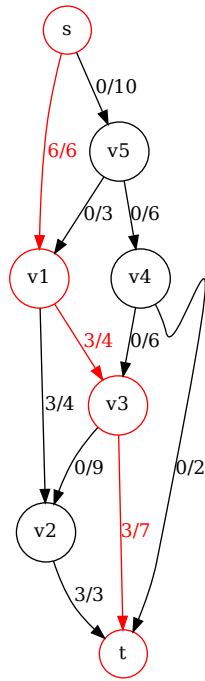
$D(0) =$		A	B	C	D	E	$\pi(0) =$		A	B	C	D	E
	A	0	4	1	$\infty$	$\infty$		A	nil	A	A	nil	nil
	B	$\infty$	0	$\infty$	$\infty$	$\infty$		B	nil	nil	nil	nil	nil
	C	$\infty$	-5	0	$\infty$	2		C	nil	C	nil	nil	C
	D	$\infty$	$\infty$	6	0	$\infty$		D	nil	nil	D	nil	nil
$D(1) =$	E	3	4	$\infty$	-4	0	$\pi(1) =$	E	E	E	nil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

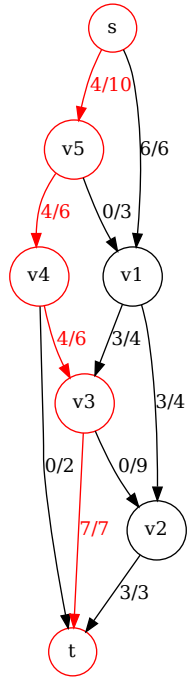
D(4) =		A	B	C	D	E	$\pi(4) =$		A	B	C	D	E
	A	0	-4	1	$\infty$	3		A	nil	C	A	nil	C
	B	$\infty$	0	$\infty$	$\infty$	$\infty$		B	nil	nil	nil	nil	nil
	C	$\infty$	-5	0	$\infty$	2		C	nil	C	nil	nil	C
	D	$\infty$	1	6	0	8		D	nil	C	D	nil	C
D(5) =	E	3	-3	2	-4	0		E	E	D	D	E	nil
		A	B	C	D	E	$\pi(5) =$		A	B	C	D	E
	A	0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

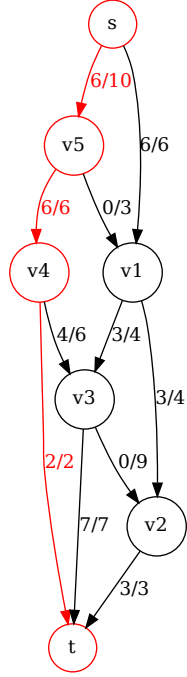


Question 2









### Question 3

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

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

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

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

The file `questionthree.pdf` hasn't been created from `questionthree.dot` yet.  
 Run `'dot -Tpdf -o questionthree.pdf questionthree.dot'` to create it.  
 Or invoke  $\text{\LaTeX}$  with the `-shell-escape` option to have this done automatically.

### 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