quiz 4 cmput 304 fall 2022

Solution for the first and the second variants of question 1:

Question 1, version 1

a) $\min\ 2y_1 + 3y_2 + 15y_3$, subject to

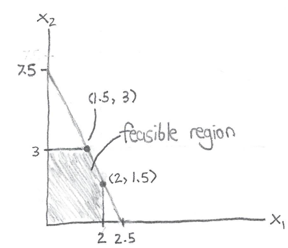
$y_1 + 6y_3 \geq 1$

$y_2 + 2y_3 \geq 3$

$y_1, y_2, y_3 \geq 0$

(primal objective: max $x_1 + 3x_2$)

b)



c) (1.5, 3) 10.5

d) Full marks for:

- citing simplex or hill-climbing
- giving a geometric description
- invoking the dual correctly (i.e. state that it has the same solution as the primal & is an upper bound)

For this quiz, we also accepted stating that you tried each vertex

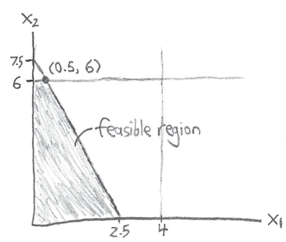
Solution for the third variant of question 1:

Question 1, version 3

a) $\min\ 4y_1 + 6y_2 + 15y_3$

$$y_1 + 6y_3 \geq 1$$
$$y_2 + 2y_3 \geq 1$$
$$y_1, y_2, y_3 \geq 0$$

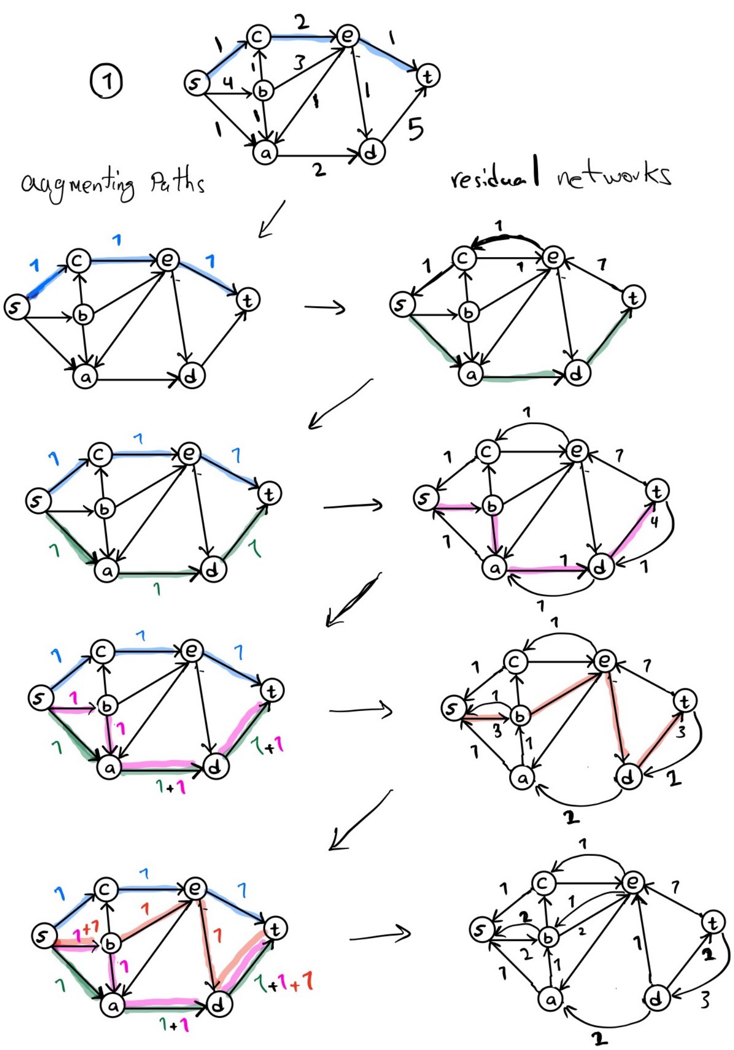
(primal objective: max $x_1 + x_2$)

b) 

c) (0.5, 6) 6.5

d) See version 1

Solution for a variant of question 2:



All the vertices reachable from s in the last residual network are: s, b, c, e, a. Since t is not in this list, there is no augmenting path therefore we found a maximum flow.

Note that $S := \{s, a, b, c, e\}$ form a minimum cut and the value of cut S is the sum of capacity of edges exiting S minus the capacity of the edges entering S in the **ORIGINAL GRAPH**: $1 + 1 + 2 = 4$. So the final answer is 4 $\{s, a, b, c, e\}$.