HW07 for ECE 9343

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December 12, 2018

1 Question 1: CLRS Exercise 24.1-1

From vertex z : See Figure 1
From vertex s : See Figure 2

2 Question 2: CLRS Exercise 24.2-1

See Figure 3

3 Question 3: CLRS Exercise 24.3-1

See Figure 4

4 Question 4: CLRS Exercise 24.3-6

Consider the modification of Dijkstra's algorithm, growing the reliable tree from one root:

INITIALIZE$(G, root)$
for each $v \in G.V$
    $v.d = 0$
    $v.\pi = nullptr$
$root.d = 1$

RELAX(u, v, r)
if $u.d < v.d * r(u, v)$
    $u.d \leftarrow v.d * r(u, v)$
    $v.\pi \leftarrow u$

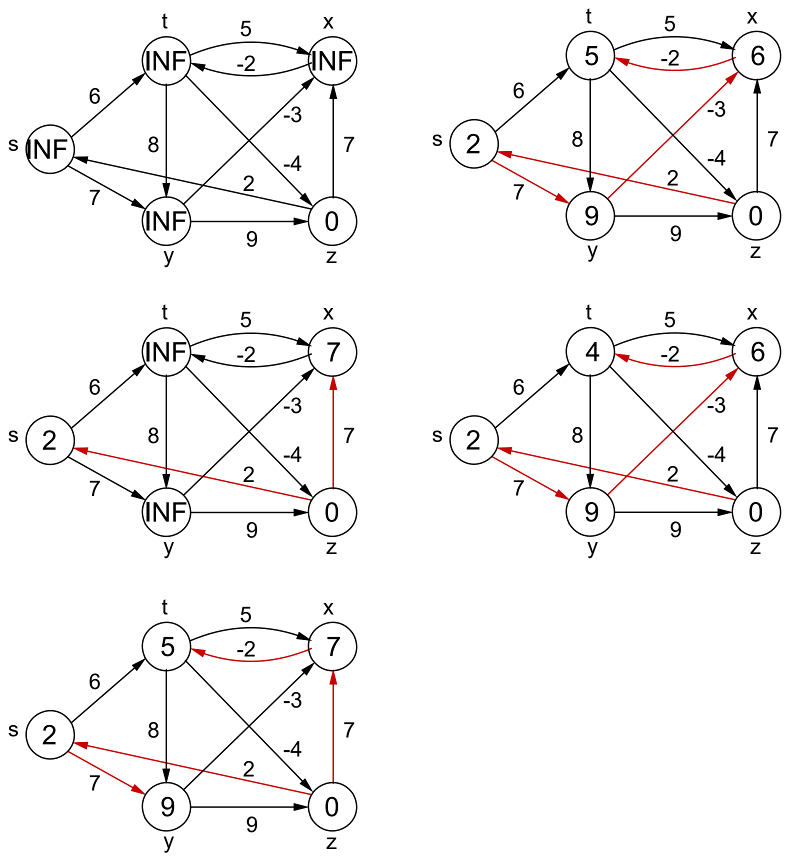

Figure 1: Exercise 24.1-1, part1

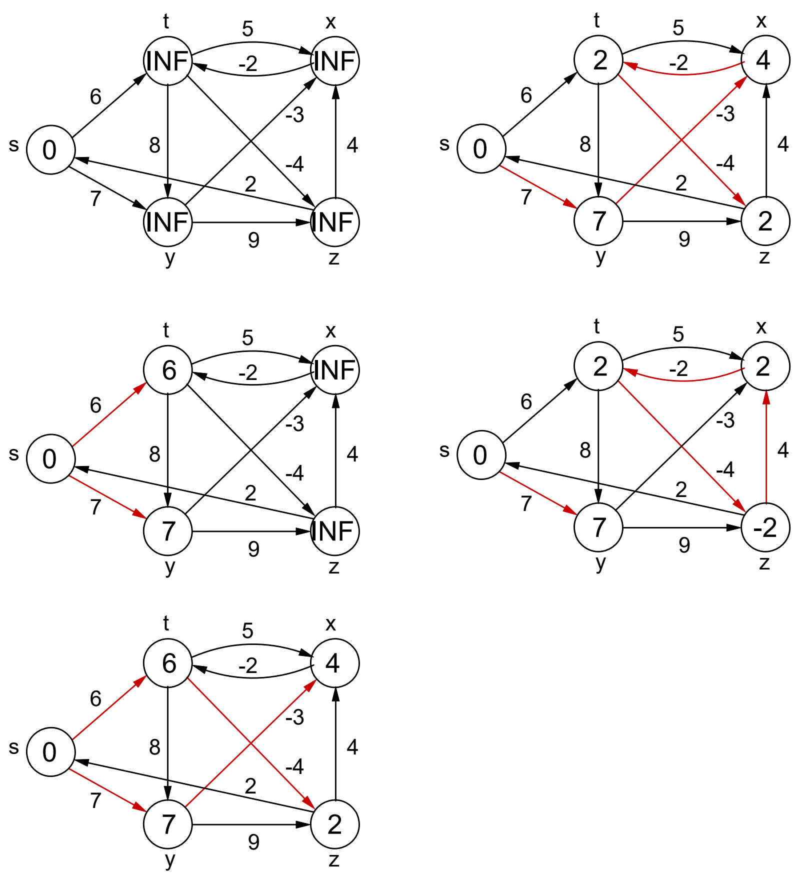

Figure 2: Exercise 24.1-1, part2

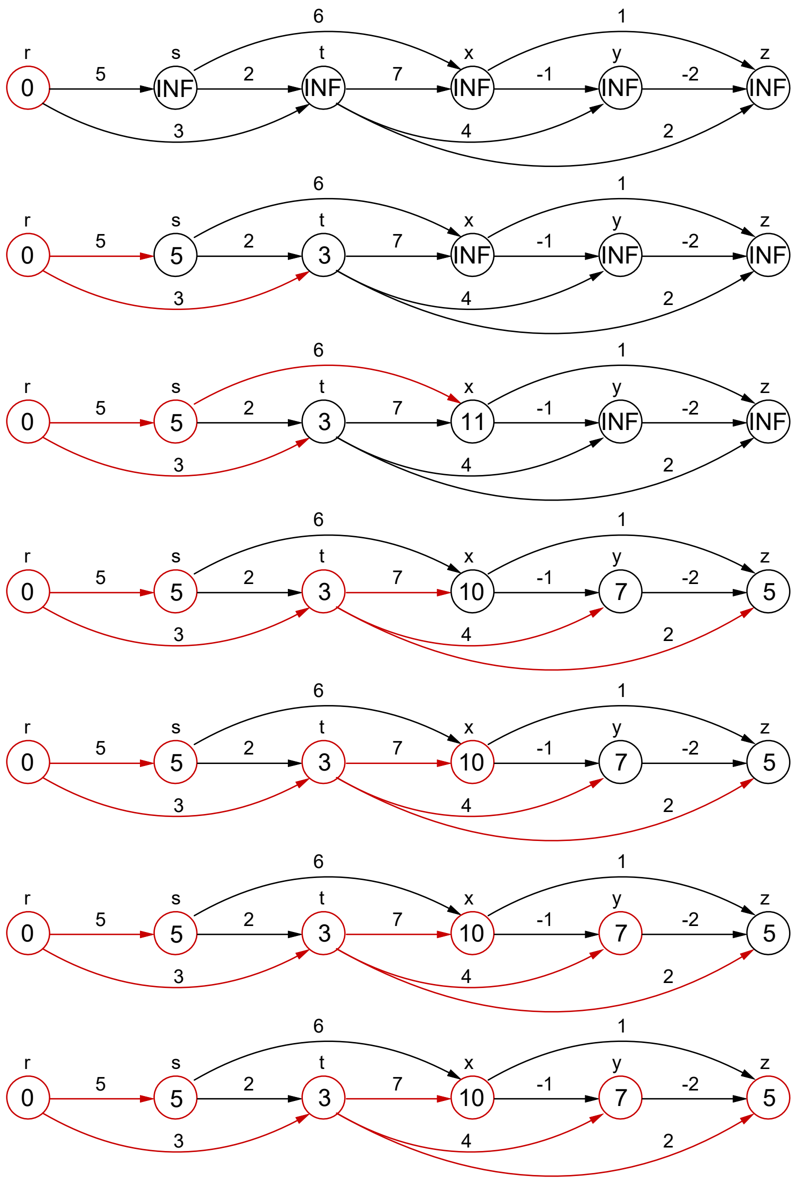

Figure 3: Exercise 24.2-1

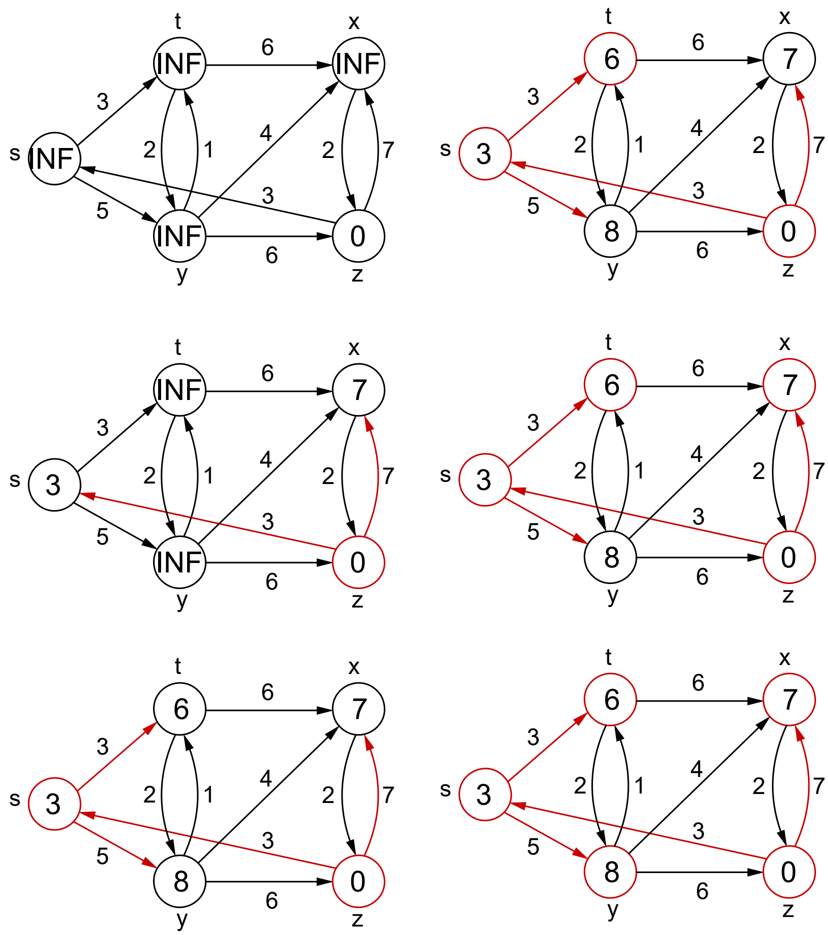

Figure 4: Exercise 24.3-1

```
RELIABLE-PATH-SEARCH(G, root)
INITIALIZE(G, root)
Q ← G.V
while !Q.empty
    u = EXTRACT-MAX(Q)
    for each v ∈ G.E(u)
        RELAX(u, v, G.r)
```

```
PRINT-PATH(G, root, v)
if v = root
    return
else
    if v.π = nullptr
        PRINT(NO SUCH PATH)
    else
        PRINT-PATH(G, r, v.π)
        PRINT(v)
```

5 Question 5: CLRS Exercise 25.2-1

$$D_0 = \begin{pmatrix} 0 & \infty & \infty & \infty & -1 & \infty \\ 1 & 0 & \infty & 2 & \infty & \infty \\ \infty & 2 & 0 & \infty & \infty & -8 \\ -4 & \infty & \infty & 0 & 3 & \infty \\ \infty & 7 & \infty & \infty & 0 & \infty \\ \infty & 5 & 10 & \infty & \infty & 0 \end{pmatrix} \quad D_1 = \begin{pmatrix} 0 & \infty & \infty & \infty & -1 & \infty \\ 1 & 0 & \infty & 2 & 0 & \infty \\ \infty & 2 & 0 & \infty & \infty & -8 \\ -4 & \infty & \infty & 0 & -5 & \infty \\ \infty & 7 & \infty & \infty & 0 & \infty \\ \infty & 5 & 10 & \infty & \infty & 0 \end{pmatrix}$$

$$D_2 = \begin{pmatrix} 0 & \infty & \infty & \infty & -1 & \infty \\ 1 & 0 & \infty & 2 & 0 & \infty \\ 3 & 2 & 0 & 4 & 2 & -8 \\ -4 & \infty & \infty & 0 & -5 & \infty \\ 8 & 7 & \infty & 9 & 0 & \infty \\ 6 & 5 & 10 & 7 & 5 & 0 \end{pmatrix} \quad D_3 = \begin{pmatrix} 0 & \infty & \infty & \infty & -1 & \infty \\ 1 & 0 & \infty & 2 & 0 & \infty \\ 3 & 2 & 0 & 4 & 2 & -8 \\ -4 & \infty & \infty & 0 & -5 & \infty \\ 8 & 7 & \infty & 9 & 0 & \infty \\ 6 & 5 & 10 & 7 & 5 & 0 \end{pmatrix}$$

$$D_4 = \begin{pmatrix} 0 & \infty & \infty & \infty & -1 & \infty \\ -2 & 0 & \infty & 2 & 0 & \infty \\ 0 & 2 & 0 & 4 & 2 & -8 \\ -4 & \infty & \infty & 0 & -5 & \infty \\ 8 & 7 & \infty & 9 & 0 & \infty \\ 6 & 5 & 10 & 7 & 5 & 0 \end{pmatrix} \quad D_5 = \begin{pmatrix} 0 & 6 & \infty & 8 & -1 & \infty \\ -2 & 0 & \infty & 2 & 0 & \infty \\ 0 & 2 & 0 & 4 & 2 & -8 \\ -4 & 10 & \infty & 0 & -5 & \infty \\ 8 & 7 & \infty & 9 & 0 & \infty \\ 6 & 5 & 10 & 7 & 5 & 0 \end{pmatrix}$$

$$D_6 = \begin{pmatrix} 0 & 6 & \infty & 8 & -1 & \infty \\ -2 & 0 & \infty & 2 & 0 & \infty \\ -2 & -3 & 0 & -1 & -3 & -8 \\ -4 & 10 & \infty & 0 & -5 & \infty \\ 8 & 7 & \infty & 9 & 0 & \infty \\ 6 & 5 & 10 & 7 & 5 & 0 \end{pmatrix}$$

6 Question 6: CLRS Exercise 25.2-2

Consider the following dynamic programming function:

$$t_{ij}^{m} = \begin{cases} i = j & m = 0 \\ \bigcup\limits_{1 \le k \le n} (t_{ik}^{m-1} \cap (w_{kj} \neq \infty)) & 1 \le m \le n-1 \end{cases}$$

Transitive-Closure-Brutal-Force(G)

$n = G.V$
$l[n][n][n] \leftarrow 0$
for each entry in $l[0]$
    $l[0][i][j] \leftarrow i = j$
for $m \leftarrow 1$ **to** $n - 1$
    for $i \leftarrow 1$ **to** n
        for $j \leftarrow 1$ **to** n
            $l[m][i][j] = \bigcup\limits_{1 \le k \le n} (l[m-1][i][k] \cap (G.w_{kj} \neq \infty))$