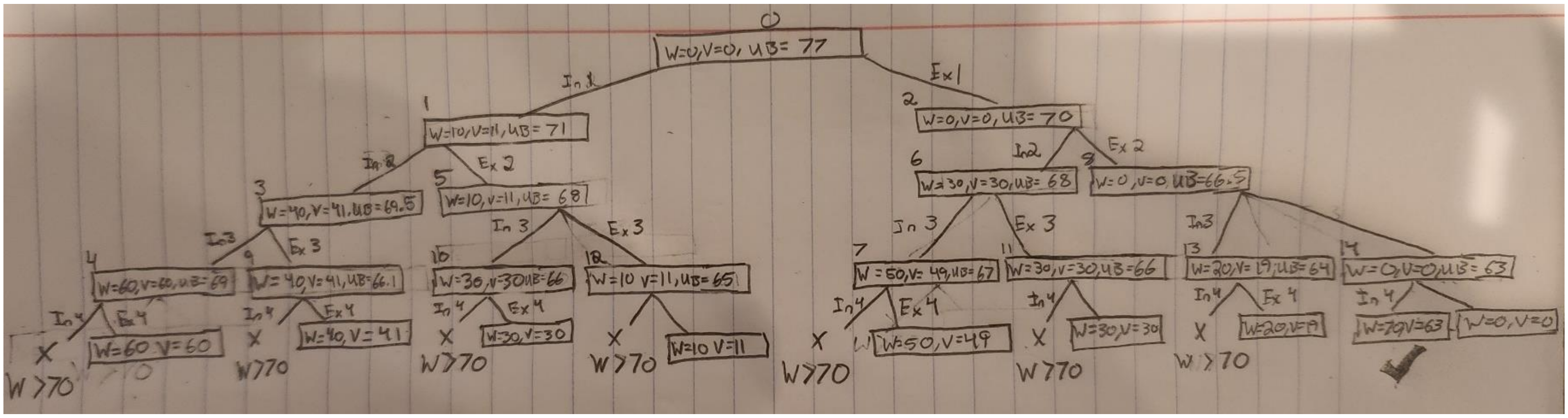
Philippe WS CSC 349

Lab 9

Problem 4



Problem 6

a.) The range is $100 \leq f(s^*) \leq 200$.

b.) The definition of 2-approximation for a maximization problem, we have the inequality $\frac{f(s*)}{f(s_a)} \leq 2$. Thus,

$$f(s^*) \leq f(s_a) * c \rightarrow f(s^*) \leq 100 * 2 \rightarrow f(s*) \leq 200$$

We also know that some optimal solution should be no worse than the approximation, thus from the former inequality, we can generate the range of $100 \leq f(s^*) \leq 200$.

Problem 7

a.) The range is $50 \leq f(s^*) \leq 100$.

b.) The definition of 2-approximation for a minimization problem, we have the inequality $\frac{f(s*)}{f(s_a)} \leq 2$. Thus,

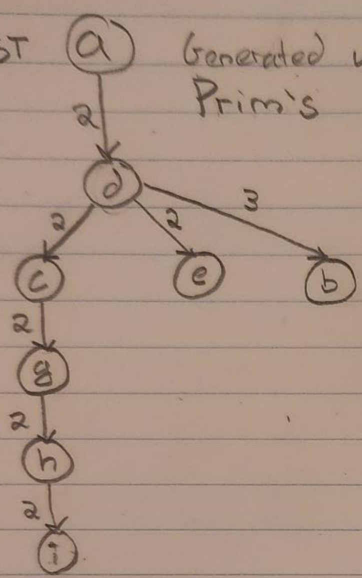
$$f(s_a) \leq f(s^*) * c \rightarrow \frac{f(s_a)}{c} \leq f(s^*) \rightarrow \frac{100}{2} \leq f(s^*) \rightarrow 50 \leq f(s^*).$$

We also know that some optimal solution should be no worse than the approximation, thus from the former inequality, we can generate the range of $50 \leq f(s^*) \leq 100$.

Problem 8

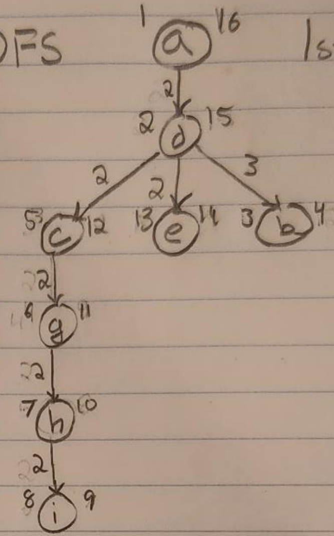
Problem 8

1.) MST



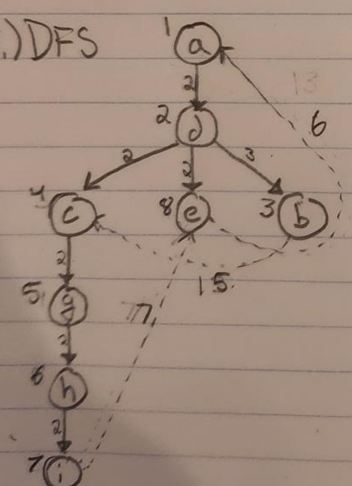
Generated using Prim's

2.) DFS



1st around the tree

3.) DFS



2nd around the tree

Tour: $a \rightarrow d \rightarrow b \rightarrow c \rightarrow g \rightarrow h \rightarrow i \rightarrow e \rightarrow a$

Final Weight: 39

This is likely not a 2-approximation because the graph does not fit the definition of metric, violating the symmetry property and the triangle property

Inspecting edges $a \xrightarrow{6} e$ and $e \xrightarrow{13} a$ shows the violation of the symmetric property, as $d[a,e]$ does not necessarily equal $d[e,a]$. $6 \neq 13$.

Inspecting edges (a,b), weight: 4, (c,a) weight: 3 (b,c) weight: 15, shows the inequality $d[a,b] + d[b,c] \geq d[a,c]$ to not hold, since $4 + 3 \ngeq 15$, violating the triangle property.