Useful References 1

- Cormen, Leiserson, Rivest & Stein
- T.C. Hu and M.T. Shing
  Enlarged Second Edition, Dover paperback
- Cook, Cunningham, Pulleyblank, Schrijver
- Korte & Vygen
- Kleinberg & Tardos
Useful References 2

- Graphs, Networks & Algorithms
  by Dieter Jungnickel

- Combinatorial Optimization
  by Alexander Schrijver
  Vol A, B, C
  Pages 1 – 1882
Node A and Node B are neighbors

A is not a neighbor of B
B is a neighbor of A
Graph Algorithms

- BFS
- DFS
- Shortest Path (Dijkstra)
- Minimum Spanning Tree (Prim)
- Shortest Paths (Floyd & Warshall)
BFS

0. Label a vertex $V_0 = 0$.
   Initialize $I = \{1\}$.

1. Let $I = \{1, 2, \ldots, k\}$.
   Let $x$ be a neighbor of the smallest index vertex.

2. Label $x$ with $k + 1$.
   Return to Step 1.
DFS

0. Same

1. Smallest ← largest

2. Same
0. Vertex $V_0$ is initialized with label
   \[ l_0^* = 0. \]
   For all other vertices $V_i$:
   \[ l_i = d_{0,i} \quad \text{if } V_i \text{ is a neighbor of } V_0 \]
   \[ l_i = \infty \quad \text{otherwise} \]

1. Pick $l_k = \min_i l_i$, then update
   \[ l_k \leftarrow l_k^*. \]

2. Relax vertex $k$’s neighbors:
   \[ l_i \leftarrow \min[l_i, l_k^* + d_{k,i}]. \]
Minimum Spanning Tree (Prim)

0. Same

1. Same

2. $l_i \leftarrow \min[l_i, d_{k,i}]$.

In general

$$l_i \leftarrow \min[l_i, \alpha l_k^* + \beta d_{k,i}]$$
Shortest Paths From 0 To All
Minimum Spanning Tree
Minimum Clock Tree