

# CPSC 368 / CPSC 516

## ASSIGNMENT 2

### Instructions:

- These problems will not be graded, however, you are encouraged to write solutions.

**Note:** Some problems below are from the course textbook. The corresponding numbers are mentioned and the problems are stated here for convenience. Please refer to this version of the textbook: <https://doi.org/10.1017/9781108699211>

### Problems:

P.1. (**Extension of Problem 2.22**) Let  $G = (V, E)$  (with  $n := |V|$  and  $m := |E|$ ) be an undirected, connected graph with a weight vector  $w \in \mathbb{R}^E$ . Consider the following algorithm for finding a maximum weight spanning tree in  $G$ .

- Sort the edges in nondecreasing order:

$$w(e_1) \leq w(e_2) \leq \dots \leq w(e_m).$$

- Set  $T := E$ .
- For  $i = 1, 2, \dots, m$ 
  - If the graph  $(V, T \setminus \{e_i\})$  is connected, set  $T := T \setminus \{e_i\}$ .
- Output  $T$ .

What is the running time of the algorithm? Is the algorithm correct? If yes prove its correctness, otherwise provide a counterexample. Assume  $m$  integers can be sorted in  $O(m \log m)$  time and, given a graph  $G'(V', E')$  as input, one can check if it is connected in  $O(|V'| + |E'|)$  time.

P.2. **Problem 2.23**

P.3. **Problem 2.24**

P.4. **Problem 2.26**