# **Excercise 5**

### Task 1

Show that the median of five numbers can be computed using six comparisons.

#### Task 2

Compute a spanning subtree of maximal weight using Kruskals algorithm for the following graph:



## Task 3

(a) Show that for each tree T = (V, E), we have |E| = |V| - 1.

(b) Show that each connected graph has a spanning subtree.

#### Task 4

Which of the following pairs is a subset system, respectively matroid?

- (a)  $(\{1,2,3\}, \{\emptyset, \{1\}, \{3\}, \{1,2\}\})$
- (b)  $(\{1,2,3\}, \{\emptyset, \{1\}, \{2\}, \{3\}, \{2,3\}\})$
- (c) (E, U), where E is a finite set and  $U = \{A \subseteq E \mid |A| \leq k\}$  for a  $k \in \mathbb{N}$
- (d) (E, U), where E is a finite set,  $E = \bigcup_{i=1}^{k} E_i$  is a partition of E and

$$U = \{ A \subseteq E \mid |A \cap E_i| \le 1 \text{ for all } 1 \le i \le k \}$$