## Exercise 1: Centralized Coloring

1. Present briefly centralized coloring.
2. Compute the complexity of centralized coloring.

## Exercise 2: Distributed Coloring

A distributed algorithm for coloring is as follows:

Each node v executes the following code:
node $v$ sends its ID to all neighbors
node $v$ receives IDs of neighbors
while node $v$ has an uncolored neighbor with higher ID do
node $v$ sends "undecided" to all neighbors
node $v$ receives new decisions from neighbors
end while
node $v$ chooses a the free color
node $v$ informs all its neighbors about its choice
I. Prove that the time complexity of the above algorithm is N and it uses at most delta+ I colors (where delta is the maximum degree of the network).
2. What is the message complexity of the algorithm (ignore the «undecided» messages in your analysis) ?
3. Does the algorithm work in the asynchronous environment ?

## Exercise 3: log* coloring

1. Recall the $\log ^{*}$ coloring for trees. Compute the message and the time complexity of this algorithm.
2. Show how the log* coloring algorithm can be adapted to the rings. Hint : nodes know the size of the network.
3. Propose a solution for coloring a tree in $\mathrm{O}\left(\log ^{*}\right)$ rounds with 3 colors provided that nodes do not know n .
