

Exercise No. 7  
**Peer-To-Peer Networks**  
Winter 2016

**Exercise 1** *Rumor spreading*

The following description is an algorithm for rumor spreading:

- At the beginning one node is infected.
- In one round, each infected node contacts and thus infects a random neighbor.
- No termination strategy is used.

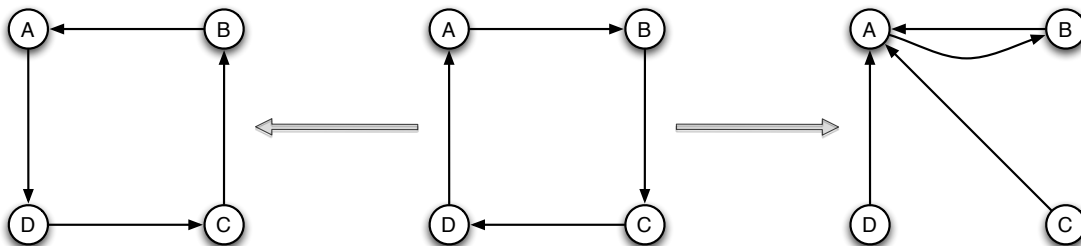
Answer the following questions for both a line of  $n$  nodes, and a balanced binary tree of  $n = 2^b - 1$  nodes ( $b \in \mathbb{N}$ ), if the first infected node is the first on the line, or the root of the tree, respectively.

1. What is the expected number of rounds necessary to infect all nodes?
2. With  $k$ -times as many as the expected number of rounds ( $k > 1$ ). What probability do you get for infecting all nodes with Chernoff?

**Exercise 2** *Simple Switching*

1. Give an example of a graph with 3-connectivity
2. Show how the graph can be disconnected using Simple Switching. What are the implications of such fact?

**Exercise 3** *Push & Pull*



Starting with the middle graph, transfer it into the left and right graphs by using the

1. Push,
2. Pull

operation.