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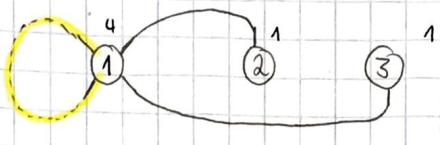
Assignment 5: "Growth and Preferential Attachment"

Complex Network Analysis

Problem 5-1 Configuration Model

1. $k = (4,1,1)$

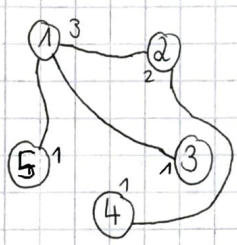


The graph must contain self-loops, a graph without self-loops or multiple edges cannot exist for ~~this~~ the given degree vector.

Reason: Node 1 has 4 stubs, but only two other nodes exist, so node 1 cannot be connected to four different nodes.

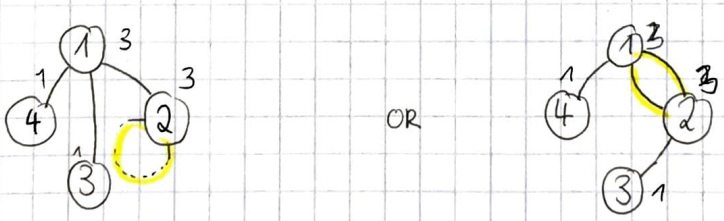
→ Here: $k_{max} = k_1 = 4 > \#nodes = n = 3$, but $k_{max} < n$ must hold.

2. $k = (3,2,1,1,1)$



A graph without self-loops or multiple edges can exist.

3. $k = (3,3,1,1)$



The graph must contain either self-loops or multiple edges, either node 1 or node 2 must have a self-loop or there must be two edges linking node 1 and 2.

~~$k_{max} = 3$ number of $k_i = k_{max} = \#k_{max} = 2 > k_3, k_4$~~

→ Here: $k_{max} = 3 = n-1$, but $\#k_{max}$ (number of nodes with degree k_{max}) $= 2 < k_3, k_4$ $(k_3 = k_4 = 1)$

But $k_i \geq \#k_{max}$ must hold for all $k_i \neq k_{max}$.