Queen Mary
University of London

Complex Networks (MTH6142)
Formative Assignment 1

- **1*. Adjacency matrix.**
  Consider the following adjacency matrix of a network

$$\mathbf{A} = \begin{pmatrix} 0 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \end{pmatrix} \tag{1}$$

  a) Is the network directed or undirected? (*Explain why*).
  b) Draw the network.
  c) List the in-degree sequence and the out-degree sequence of the network
  d) Determine the in-degree distribution and the out-degree distribution.

- **2*. Number network.**
  Given the set of nodes V, with $|V| = 6$, in which each node i is labelled by a natural number between 1 and 6, $i = 1, 2, 3, 4, 5, 6$, consider the directed network $G = (V, E)$ where each link from node j to node i indicates that j is a multiple of i.
  a) Draw the network.
  b) Write down the adjacency matrix of the network.
  c) Are there tadpoles in the network? How many?

- **3. Complex networks.**
  Lists 5 examples of complex networks, specifing
  - what objects the nodes represent;
  - what type of interaction the links indicate;
  - if the network is directed or undirected;
  - if the network is weighted or unweighted;
  - if the network is signed.