(2)

(a) Find (without explicit calculation) an example of a 4×4 nonzero adjacency matrix such that all powers beyond the 10th power are 0. Justify briefly.

$$\begin{pmatrix} 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

The matrix is connected only one way so there are no paths with length more than 1.