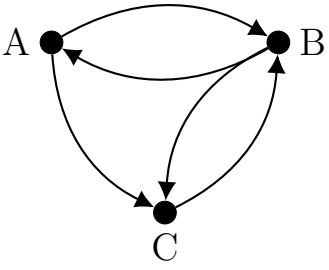
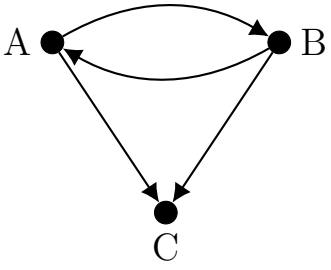
PageRank exercises

1. Find a ranking for the following graphs by finding an eigenvector by hand.

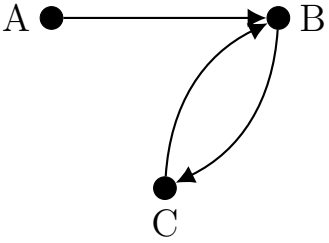


(a)

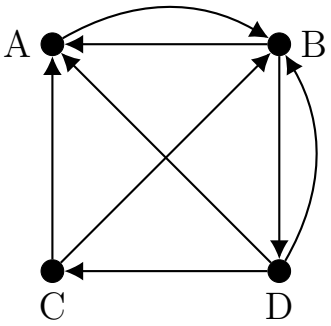


(b)

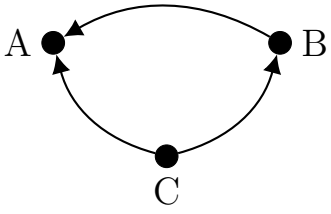
2. Find a ranking for the following graphs by finding an eigenvector using Python.



(a)



(b)



(c)

Answers

1. (a) Ranking is B, C, A based on eigenvector

$$\begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} \frac{2}{9} \\ \frac{4}{9} \\ \frac{3}{9} \end{bmatrix} = \begin{bmatrix} 0.2222 \\ 0.4444 \\ 0.3333 \end{bmatrix}.$$

   (b) Ranking is C first, then A and B joint second, based on eigenvector

$$\begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} \frac{2}{7} \\ \frac{2}{7} \\ \frac{3}{7} \end{bmatrix} = \begin{bmatrix} 0.2857 \\ 0.2857 \\ 0.4286 \end{bmatrix}.$$

2. (a) Ranking is B, C, A, based on eigenvector

$$\begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} \frac{1}{20} \\ \frac{360}{740} \\ \frac{343}{740} \end{bmatrix} = \begin{bmatrix} 0.0500 \\ 0.4865 \\ 0.4635 \end{bmatrix}.$$

   (b) Ranking is B, A, D, C, based on eigenvector

$$\begin{bmatrix} A \\ B \\ C \\ D \end{bmatrix} = \begin{bmatrix} \frac{9}{29} \\ \frac{12}{29} \\ \frac{2}{29} \\ \frac{6}{29} \end{bmatrix} = \begin{bmatrix} 0.3103 \\ 0.4138 \\ 0.0690 \\ 0.2069 \end{bmatrix}.$$

   (c) Ranking is A, B, C, based on eigenvector

$$\begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} \frac{6}{11} \\ \frac{3}{11} \\ \frac{2}{11} \end{bmatrix} = \begin{bmatrix} 0.5455 \\ 0.2727 \\ 0.1818 \end{bmatrix}.$$