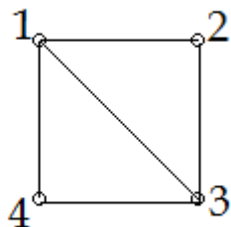


MATH 401/801: Sample Midterm Test

Math 401: Do any two questions.

Math 801: Do all three questions.

No computers or calculators allowed.



1. For the graph above, compute the eigenvalues of its adjacency matrix.
2. For the graph above, show that the number of closed walks of length n is given by

$$\left(\frac{1 + \sqrt{17}}{2}\right)^n + \left(\frac{1 - \sqrt{17}}{2}\right)^n + (-1)^n$$

3. A communication link is desired between five universities in Canada: Queen's, Toronto, Waterloo, McGill and UBC. With obvious notation, the matrix below gives the cost (in thousands of dollars) of building such a connection between any two of the universities.

$$\begin{array}{c} Q \quad T \quad W \quad M \quad U \\ \begin{array}{l} Q \\ T \\ W \\ M \\ U \end{array} \begin{pmatrix} - & 350 & 400 & 300 & 1200 \\ 350 & - & 100 & 600 & 1300 \\ 400 & 100 & - & 700 & 1400 \\ 300 & 600 & 700 & - & 1600 \\ 1200 & 1300 & 1400 & 1600 & - \end{pmatrix} \end{array}$$

Use the greedy algorithm to determine the minimal cost so that all universities are connected.