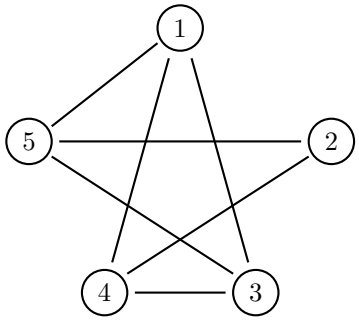
MTH 309 - Activity 8
Matrix Algebra

1. Consider the following network.



Definition: A path from node i to node j is a sequence of links that starts with node i and ends at node j. When no arrows are indicated, direction does not matter.

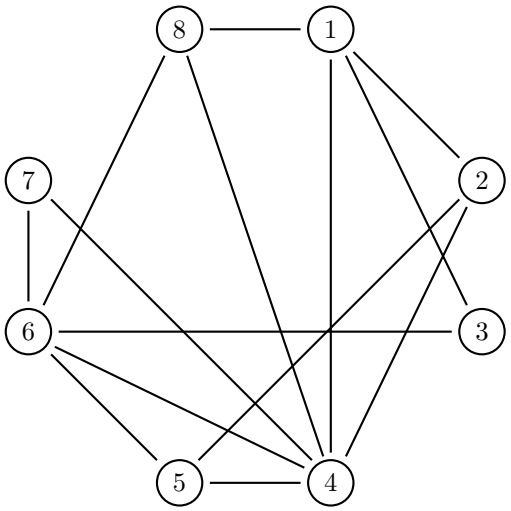
(a) How many paths are there from node 1 to node 2 of length 2? Length 3?

(b) Construct a 5×5 matrix of 0s and 1s that represents the links that are included in the network. Let's call it A.

(c) Consider the path 4-1-5 in the network. For the two links in this path 4-1 and 1-5, where are these links represented in your matrix? Circle them.

(d) Do the same for the paths 4-2-5 and 4-3-5. What do you notice about the relationship between the circled entries.

2. Now consider an even larger network.



(a) Construct the 8×8 matrix of 0s and 1s that represents this network. Let's call it B.

(b) Use what you learned from the previous problem to determine, from the matrix, how many paths of length 2 there are from node 1 to node 6.

(c) Consider the matrix vector product $B \cdot B_{*6}$. What do the coordinates of the resulting vector tell us about paths in the network.

(d) How could we expand the computation to cover the entire network?

3. Using the same network, how could we compute the number of paths of length 3?