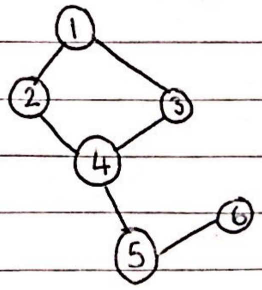
GRAPH THEORY + MATRICES

adjacency matrix:

given by the vertices of that matrix and labelled with 1 or 0 depending on adjacency. Label vertex with adjacency by (i,j) - i is row, j is column.



undirected graph

$$
\begin{array}{c|cccccc}
 & 1 & 2 & 3 & 4 & 5 & 6 \\
\hline
1 & 0 & 1 & 1 & 0 & 0 & 0 \\
2 & 1 & 0 & 0 & 1 & 0 & 0 \\
3 & 1 & 0 & 0 & 1 & 0 & 0 \\
4 & 0 & 1 & 1 & 0 & 1 & 0 \\
5 & 0 & 0 & 0 & 1 & 0 & 1 \\
6 & 0 & 0 & 0 & 0 & 1 & 0
\end{array}
$$

Adjacency matrix

can see from graph that vertex 1 is adjacent to both 2 and 3, so in the adjacency matrix, 2 and 3 are denoted by 1's (and the rest 0s)

can be used to find the number of walks between vertices. Just raise the matrix to the L (length of walk) and read off the matrix as (i,j)

Transition Matrix:

a matrix that shows random walks and its probabilities for each step.

$$
P = \; i \;
\begin{array}{c|cccc}
 & \multicolumn{4}{c}{j} \\
 & 0 & 1 & 2 & 3 \\
\hline
0 & 0 & 1 & 0 & 0 \\
1 & 1/3 & 0 & 2/3 & 0 \\
2 & 0 & 2/3 & 0 & 1/3 \\
3 & 0 & 0 & 1 & 0
\end{array}
$$

read probabilities between vertices as P_{ij}, where i and j are row + column respectively.

Shows there is a probability of 2/3 from vertex 1 to vertex 2

Transition matrix can be done for different lengths, L. just raise P to the power L.