Problem 1. Compute the following matrix-matrix product $\begin{bmatrix} 1 & 0 & 2 & 2 \\ 1 & 1 & -1 & -1 \\ 0 & 0 & -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 2 \\ 1 & 1 & -1 \\ 0 & 0 & -1 \\ 1 & 1 & 1 \end{bmatrix}$.

Problem 2. What is the degree of each node of a fully connected graph with 3 nodes with self loops? What is the degree of each node of a fully connected graph with 5 nodes without self loops?

Problem 3. Consider the graph below and answer the following questions.

(a) Is the graph directed or undirected?

(b) What is the degree of node 2?

(c) Draw a shortest path between nodes 0 and 6. What is the length of this shortest path? Is this shortest path unique (is there another path with the same length)?

(d) Draw a shortest path between nodes 2 and 5. Is there another shortest path? What is the length of this shortest path? Is this shortest path unique (is there another path with the same length)?

(e) Compute the adjacency matrix for the above graph.