2.38 For the adjacency matrix A, determine A^2 and A^3.

$A^2 =$

$$\begin{bmatrix} 2 & 1 & 1 & 1 & 0 \\ 1 & 2 & 1 & 1 & 0 \\ 1 & 1 & 3 & 0 & 1 \\ 1 & 1 & 0 & 2 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix}$$

$A^3 =$

$$\begin{bmatrix} 2 & 3 & 4 & 1 & 1 \\ 3 & 2 & 4 & 1 & 1 \\ 4 & 4 & 2 & 4 & 0 \\ 1 & 1 & 4 & 0 & 2 \\ 1 & 1 & 0 & 2 & 0 \end{bmatrix}$$

2.41

a) Compute BB^t

$BB^t =$

$$\begin{bmatrix} 3 & 1 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 & 0 \\ 1 & 0 & 2 & 1 & 0 \\ 1 & 1 & 1 & 4 & 1 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

b) What does the (i, j) entry of BB^t represent?

The i is the vertex and the j is the edge. 0 means there is no connection, 1 means there is a connection. And the diagonal entries represent the degrees for each vertex.

3.2 Give an example of 3 graphs of the same size, order, and degree sequence that are not isomorphic to one another.
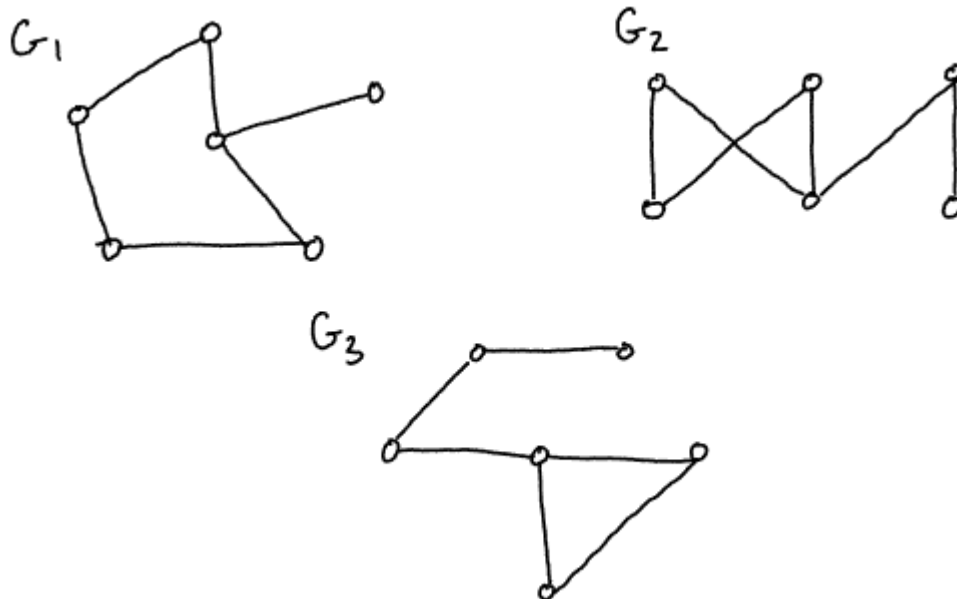
Here each graph has order 6, size 6, and degree sequence (3, 2, 2, 2, 2, 1) but they are not isomorphic to one another.

4.2

4.4