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Department of Mathematics and Statistics
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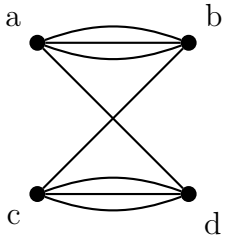
MA4016 - Engineering Mathematics 6

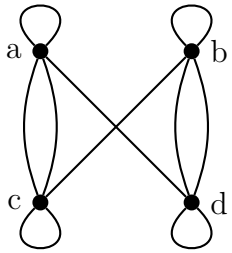
Problem Sheet 9: Graphs (April 09, 2010)

1. Represent the given graphs using an adjacency matrix and an incidence matrix.

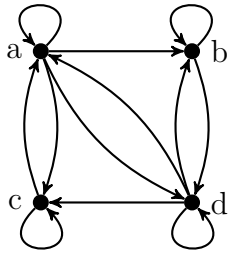
a)



b)



c)

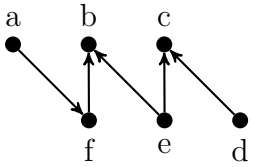


2. Draw the graphs represented by the given adjacency matrices.

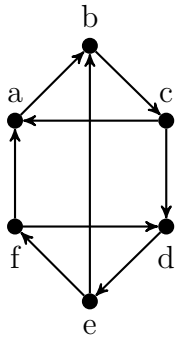
a) $\begin{pmatrix} 1 & 3 & 2 \\ 3 & 0 & 4 \\ 2 & 4 & 0 \end{pmatrix}$ **b)** $\begin{pmatrix} 0 & 1 & 3 & 0 & 4 \\ 1 & 2 & 1 & 3 & 0 \\ 3 & 1 & 1 & 0 & 1 \\ 0 & 3 & 0 & 0 & 2 \\ 4 & 0 & 1 & 2 & 3 \end{pmatrix}$ **c)** $\begin{pmatrix} 0 & 2 & 3 & 0 \\ 1 & 2 & 2 & 1 \\ 2 & 1 & 1 & 0 \\ 1 & 0 & 0 & 2 \end{pmatrix}$

3. Determine whether each of the following graphs is strongly connected and if not, whether it is weakly connected.

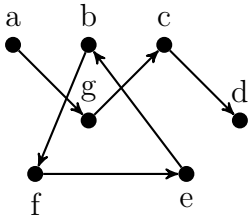
a)



b)



c)



4. Find the number of paths of length n between
a) two adjacent vertices
b) two non-adjacent vertices
in K_4 and $K_{3,3}$ if $n = 2, 3, 4, 5$.

5. How many nonisomorphic connected simple graphs are there with n vertices when $n = 2, 3, 4, 5$?

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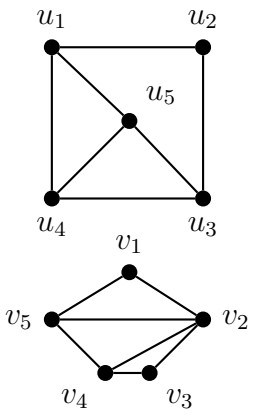
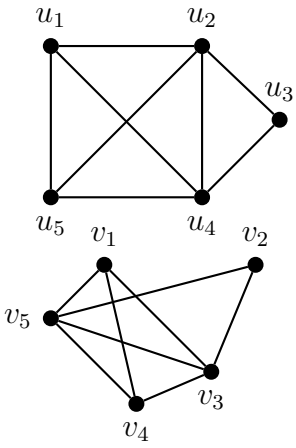
6. Determine whether the given pairs of graphs are isomorphic. Exhibit an isomorphism or provide a rigorous argument that none exists.

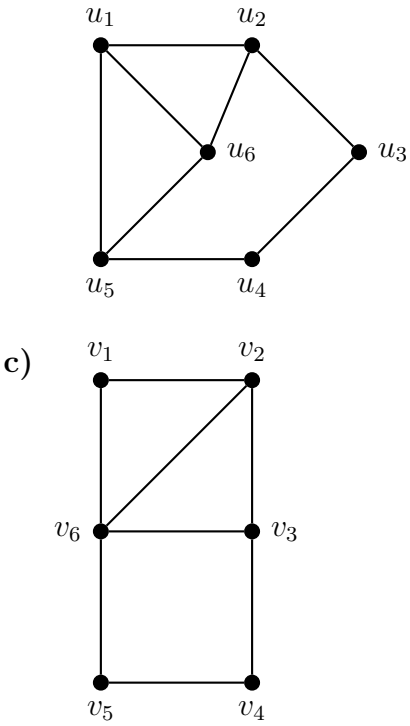
a)



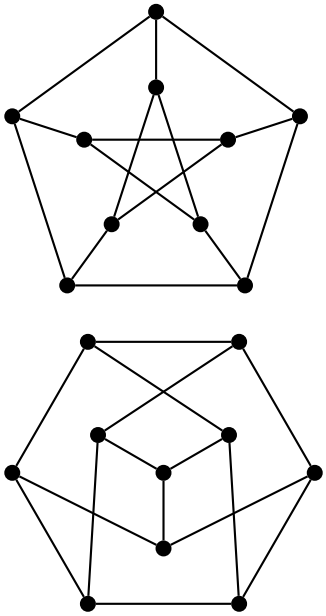
b)



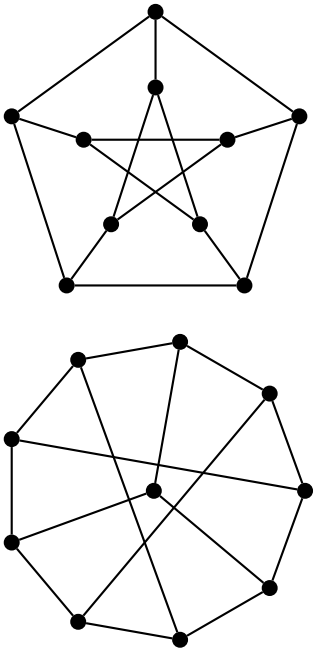
c)



d)



e)



f)