HW #5

Kerry Ojakian's CSI 35 Class

Due Date: Thursday November 13 (beginning of class)

General Instructions:

- Homework must be stapled, be relatively neat, and have your name on it.
- Use tutors, work with other students, but ... don't copy!

The Assignment

1. Consider the the graph on vertices $\{1, 2, 3, 4, 5, 6\}$ with edges:

$$\{1,2\},\{2,3\},\{1,3\},\{4,5\}\{5,6\}$$

Draw it, and write down its adjacency matrix.

2. Consider the following adjacency matrix for a graph on vertex set $\{1, 2, 3, 4, 5\}$.

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

Draw the graph, write down its edge set, and find its adjacency list representation. What is the common name for this graph? (i.e. from among the classes P_n , C_n , K_n , $K_{a,b}$, etc)

3. Draw K_4 . Find a connected subgraph which is not an induced subgraph. Find a different graph from K_4 such that every connected subgraph is in fact an induced subgraph (choose a small example! and verify by checking all connected subgraphs).

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$$P_n \quad C_n \quad K_{a,b} \quad K_n$$

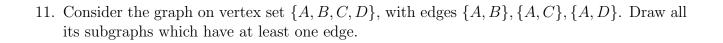
5. Consider C_4 expressed as follows: Its vertex set is $\{1,2,3,4\}$; its edge set is $\{1,2\},\{2,3\},\{3,4\},\{4,1\}\}$.

Find all the graphs (on the same vertex set) which are not the same, but are isomorphic.

6. Consider P_4 expressed as follows: Its vertex set is $\{1,2,3,4\}$; its edge set is $\{1,2\},\{2,3\},\{3,4\},\}$.

Find all the graphs (on the same vertex set) which are not the same, but are isomorphic.

7.	Find two graphs with the same degree sequence which are not isomorphic (don't look it up!
8.	Draw a strongly connected directed graph with 4 arcs and 4 vertices. Write down its adjacency matrix.
9.	Suppose the degree sequence of a graph is 1, 2, 2, 3, 3, 3. How many edges are in the graph's
10.	Suppose someone tells you they have a graph with degree sequence 1, 2, 2, 2, 4, 5, 5. How do you know they are lying? (or at least mistaken)



12. Consider the graph on vertex set $\{A,B,C,D\}$, with edges

$${A,B},{A,C},{A,D},{B,C},{B,D}.$$

Draw all its *induced* subgraphs which have at least one edge.

13. Consider the graph given by the following adjacency list representation.

A	B, C
B	A, C, D
\overline{C}	A, B, D
\overline{D}	B, C

Draw the graph. Find its adjacency matrix. What is its connectivity?