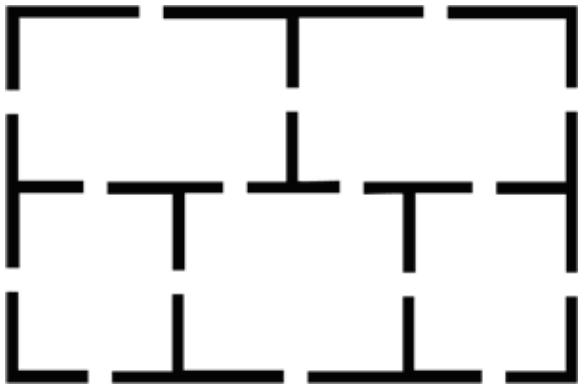
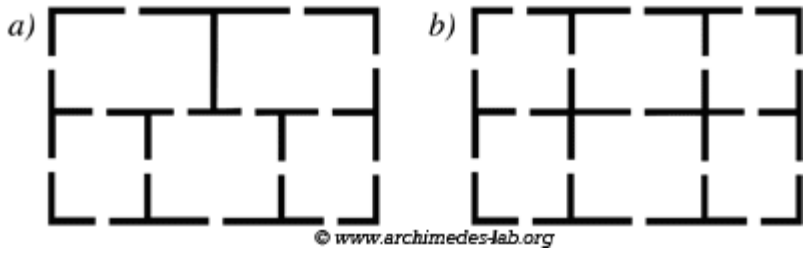
MATH 101 **Name:** _____

GRAPH THEORY EXERCISES
EULERIAN GRAPHS, REPRESENTATION AND APPLICATION

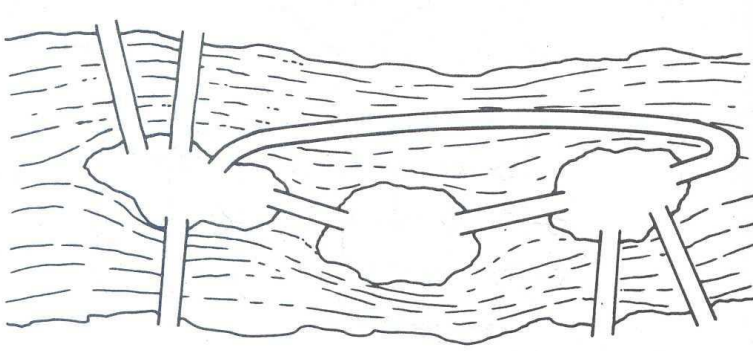
1) The following diagram is of a 5-room house. In the large blank space at the bottom of this page, *DRAW A GRAPH* *consisting of vertices and edges* to **model** this diagram. Your vertices should represent locations, and your edges should represent connections. **USE** your graph to determine if it is possible to visit every room using each door exactly once. IF it is possible, draw this path on the "house" to show the answer. IF it is not possible, explain why in a mathematically precise way.

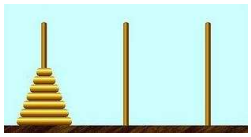


2) Here are two additional "houses." The question you're being asked regarding each of these is the same as in problem #1 on the previous page. Be sure to address each part of the directions.



3) Below is a situation similar to that of the Konigsberg Bridge Problem that was discussed in class and in your textbook. Use what you know of graph theory to determine if an Eulerian trail or Eulerian circuit exists here. Explain your answer using one or two full sentences using the ideas of graph theory.





4) In class we created a graph that gave all the moves (and solutions) for a 2-disk *Towers of Hanoi* puzzle. Use the space below to create a ***GRAPH*** for 3-disk *Towers of Hanoi*. It is a graph that is being asked for here, ***not*** pictures of various stages of solving the puzzle - although you may want to draw pictures of the steps on scratch paper to help you with your work.

5) There is a legend that goes with the *Towers of Hanoi* puzzle, and that is that in an Asian temple monks have the task of solving this puzzle with 64 disks. They work at it in shifts, working around the clock and moving one disk per second; they never make a mistake in their moves. The legend is that when they have completed the task the world will end. How long will it be from the time they began until the time they finish? (A java applet that you can actually play of this puzzle is at the link below. If the link is broken do a Google search for 'interactive towers of Hanoi game.')

http://www.mazeworks.com/hanoi/index.htm