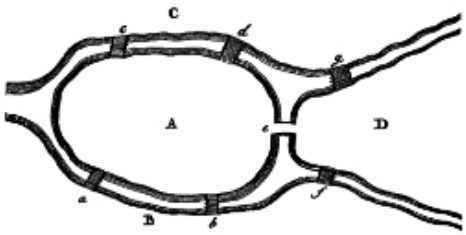
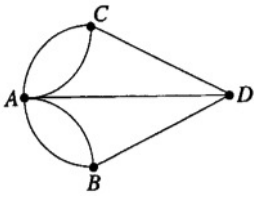
Math 110 Final Journal Problems

Mindscape 1: The Königsberg bridge problem. The city of Königsberg was formerly in Germany but is now known as Kaliningrad and is part of Russia. The river Preger runs through the city and in the 18th century there were seven bridges over the river. This problem asks if the seven bridges can all be traversed in a single trip without doubling back over any bridge, with the additional requirement that the trip ends in the same place it began.



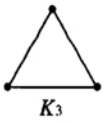


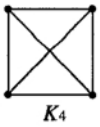
a) What is the problem asking you to find: a path, a circuit? an Euler path, or an Euler circuit?

b) Using the theorems we have developed, answer the question in one or two sentences.

Mindscape 2. A **complete** graph is a graph so that every pair of distinct vertices is joined by exactly one edge. The complete graph on n vertices is denoted with the symbol K_n. Below are pictures of K_3, K_4, and K_5. (Notice edges must cross where there are no vertices.)

a) Draw K_2, K_6, and K_7 and then use your drawings to fill in the table.





Graph	K_2	K_3	K_4	K_5	K_6	K_7	General K_n
Degree of each Vertex			3				
Degree Sum in Graph			12				
Total # of Edges			6				
Euler Circuit? Y/N			No				

b) The total number of edges in K_n is _____. Explain why your formula is true.

c) Which complete graphs have an Euler circuit? You should see a pattern. Express your observation as a theorem: *The complete graph K_n has an Euler circuit only if n* _____. Explain why your theorem is true.

d) Does K_{2010} have an Euler circuit? Explain.

Mindscape 3. It's a matter of degree.

a) A graph has 5 vertices. Can the degree of each vertex be odd?

b) A graph has 6 vertices. The first 5 have degrees 1, 2, 3, 3, and 6, respectively. If there are 10 edges in the graph what is the degree of the missing vertex? Explain your reasoning.