

Graphs: Assignment #3

Your paper should have the following information on it.

- Your name
- Your student ID number
- Which section you are in: 02 MWF, or 04 TTh

Specifications for Grading

To earn a passing mark, your assignment must:

- be typed, and at least one page and no more than two pages in length. Diagrams may be hand drawn.
- address the tasks and questions below.
- explain your ideas in complete sentences. Use paragraphs to organize your thoughts.
- conform to reasonable standards for grammar, spelling, and usage of the English language with minimal errors. (You may consider seeking help on writing from the Writing Center in the Academic Learning Center. <http://www.uni.edu/unialc/writing-center>)
- be turned in by 3pm on Friday, January 22.

What to do

Task 1. We spent a lot of time studying planar graphs, and along the way we learned that $K_{3,3}$ and K_5 are not planar. Make an example of a new graph G which has the following properties:

- The graph G is not planar.
- The graph G is not equal to $K_{3,3}$.
- The graph G is not equal to K_5 .

Task 2. The King in Königsberg decided the best way around his bridges problem is to build some more bridges! Draw a new map of Königsberg which includes the seven original bridges, plus some new ones that make the puzzle actually have a solution. Then give clear directions for how a citizen of Königsberg could walk in a closed circuit around the city while crossing each of the bridges, old and new, exactly once.

How many new bridges do you really *need* to make an Eulerian circuit? Can you get away with only one more? only two more?

Task 3. Discuss how to turn the concrete *Five Rooms Puzzle* into a task about Eulerian circuits on a certain graph. Draw pictures and explain your ideas completely.