MATH 4. Handout # 14

Positive and negative numbers. Absolute value of a number.

$$\begin{cases} |a| = a, & if\ a \geq 0 \\ |a| = -a, & if\ a < 0 \end{cases}$$

Complex fractions.

Complex fractions are formed by two fractional expressions, one on the top and the other one on the bottom, for example:

$$\frac{\frac{1}{2}+\frac{1}{3}}{\frac{7}{9}-\frac{2}{5}}$$

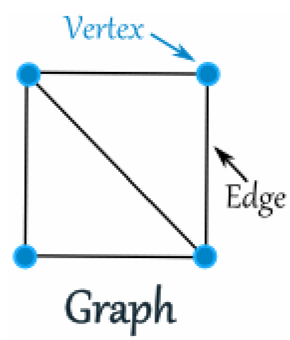
The fraction bar is a just another way to write the division sign, so we can re-write:

$$\frac{\frac{1}{2}+\frac{1}{3}}{\frac{2}{3}+\frac{1}{4}} = (\frac{1}{2}+\frac{1}{3}) \div (\frac{2}{3}+\frac{1}{4})$$

It is easy to simplify a complex fraction:

$$\frac{\frac{1}{2}+\frac{1}{3}}{\frac{2}{3}+\frac{1}{4}} = \left(\frac{1}{2}+\frac{1}{3}\right) \div \left(\frac{2}{3}+\frac{1}{4}\right) = \frac{\frac{3}{6}+\frac{2}{6}}{\frac{8}{12}+\frac{3}{12}} = \frac{\frac{5}{6}}{\frac{11}{12}} = \frac{5}{6} \div \frac{11}{12} = \frac{5}{6} \cdot \frac{12}{11} = \frac{5}{1} \cdot \frac{2}{11} = \frac{10}{11}$$

GRAPHS



A graph (G) is a mathematical model consisting of a finite set of vertices (V) and a finite set of edges (E). The vertices, represented by points, may be connected by edges, represented by line segments.

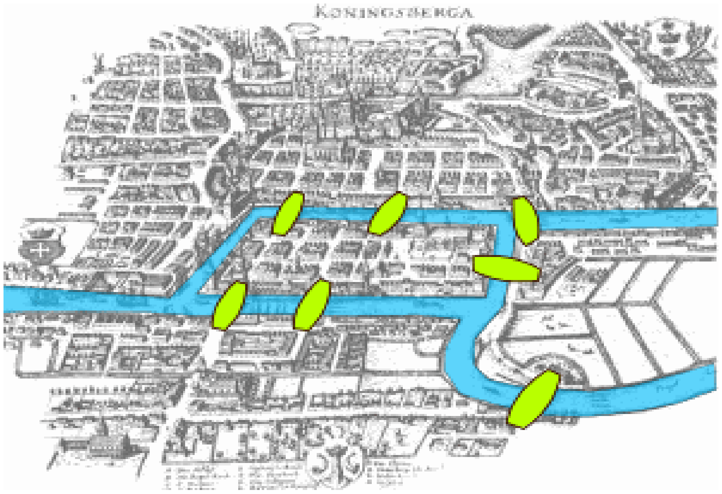
Lines of the graphs- Segments

Points where segments intersect- VERTICES (“Vertex” in singular) or NODES

The number of segments originating from a vertex is called THE DEGREE OF THE VERTEX. In other words, the degree of a node is the number of edges touching it.

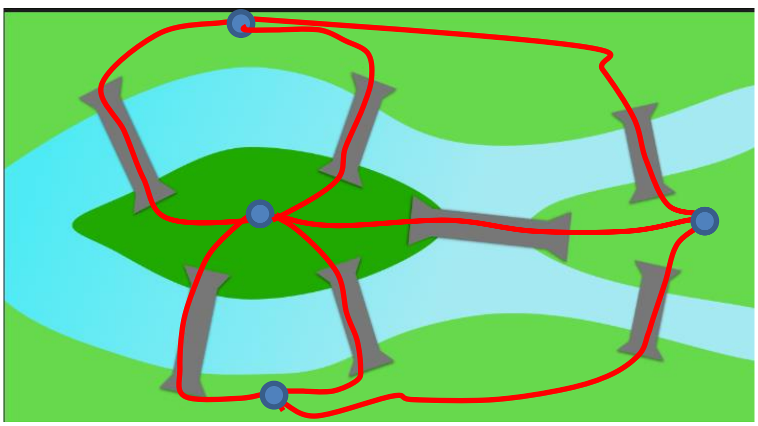
A vertex that has degree equal to zero is called an isolated vertex.

The old town of Königsberg has seven bridges:



Can you leave your home, take a walk through the town, visiting each part of the town and returning home crossing each bridge only once?

Euler (pronounced as [Oiler]) showed that the possibility of a walk through a graph, traversing each edge exactly once, depends on the degrees of the nodes.

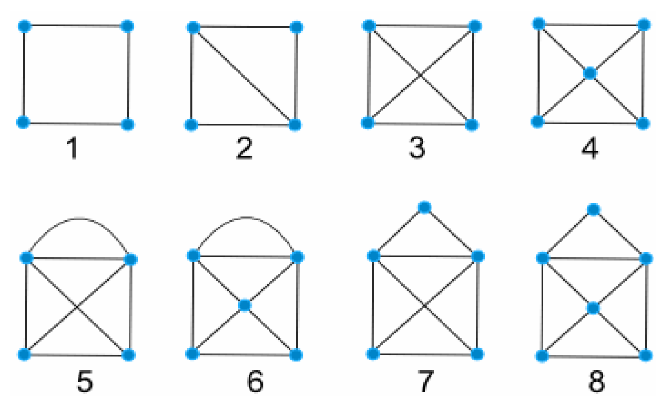


An Eulerian cycle, Eulerian **circuit** in a graph is a cycle that uses each edge exactly once and it ends in the vertex from which it started.

An Eulerian path uses each edge exactly once but it ends in a different vertex

A graph can be drawn with a single line if and ONLY if:

1. The graph is connected
2. The number of vertices with the odd degrees in the graph are 0 or 2



# of ODD Vertices	Implication (for a connected graph)
0	There is at least one Euler Circuit.
2	There is no Euler Circuit but at least 1 Euler Path.
more than 2	There are no Euler Circuits or Euler Paths.