Graph Theory

TU SMILE 2020

**Exercise 1 (Drawing graphs without lifting your pen)**

A graph is a collection of vertices (or dots or nodes) where some pairs are joined together by an edge (which does not have to be a straight line).

Try to draw the following graphs **without picking up your pen** by starting at one vertex and drawing edges one at a time. Keep track of which vertex you start and stop at. If you finish early try to see if there is more than one way to complete this task.

**Some definitions:**

A *path* in a graph is a sequence of edges that join two vertices called the *start vertex* and the *end vertex*. A *cycle* in a graph is a path where the start and end vertices are the same. Using the presentation, fill in the blanks below:

An *Euler path* is .

An *Euler cycle* is .

**Exercise 2 (Detecting Euler paths and Euler cycles)**

Each of the following graphs contain an Euler path.

Determine whether they contain an Euler cycle as well.

**Exercise 3 (Euler cycles in the real world)**

Brainstorm: How might Euler cycles or Euler paths be applied to study the real world?

**Exercise 4 (Constructing complicated Euler cycles)**

Finding Euler paths or Euler cycles can be challenging. We will build a graph that contains a very complicated Euler cycle.

Construct a graph with 6 vertices so that every vertex has degree 2 or 4 and at least one vertex has degree 4.