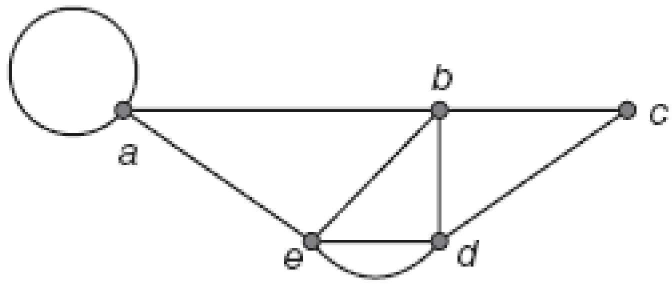
Minh Anh Nguyen
Your class **Your Excersice**

Section 2.1:

1. Consider the following undirected graph.



   (a) How many edges are there in this graph?

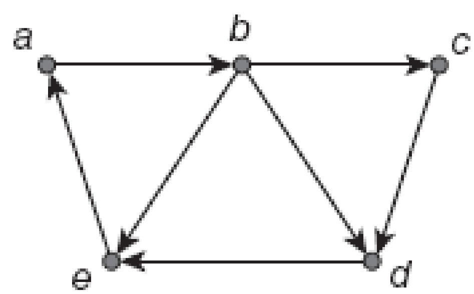
   There are 9 edges in this graph.

   (b) Give the degree of each vertex.
   The dergree of each vertex is:

   a has degree 4
   b has degree 4
   c has degree 2
   d has degree 4
   e has degree 4

   (c) Do these numbers agree with Euler's first observation?
   The sum of the degrees is 4 + 4 + 2 + 4 + 4 = 18.
   There are 9 edges in the graph.
   The sum of the degrees is doubled the number of edges.
   Hence, these numbers agree with Euler's first observation.

2. Consider the following directed graph.



(a) Give the indegree of each vertex.

The indegree of a is 1.
The indegree of b is 1.
The indegree of c is 1.
The indegree of d is 2.
The indegree of e is 2.

(b) Give the outdegree of each vertex.

The outdegree of a is 1.
The outdegree of b is 3.
The outdegree of c is 1.
The outdegree of d is 1.
The outdegree of e is 1.

(c) Compute the sum of the indegrees and the sum of the outdegrees. What do you notice?
The sum of the indegrees is:

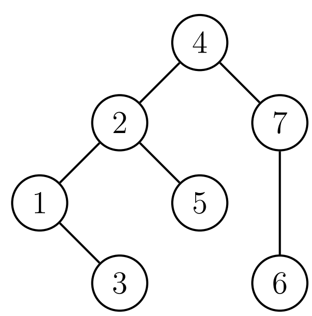
$$1 + 1 + 1 + 2 + 2 = 7$$

The sum of the outdegrees is:

$$1 + 3 + 1 + 1 + 1 = 7$$

I noticed that the sum of the indegrees is equal to the sum of outdegrees and also equal to the numbers of edges.

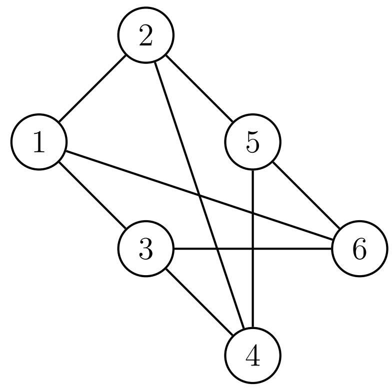
3. A circuit is *simple* if it has no repeated edges. Draw a connected, undirected graph with seven vertices and no simple circuits. How many edges does it have?



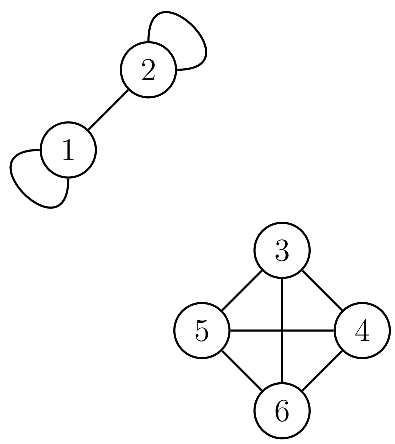
It has 6 edges.

4. Draw an undirected graph with six vertices, each of degree 3, such that the graph is:

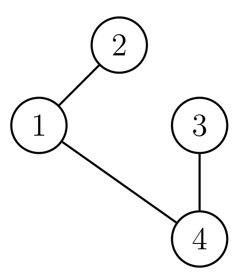
   (a) Connected.



   (b) Not connected.



5. A graph is called simple if it has no multiple edges or loops. Draw five different connected, simple, undirected graphs with four vertices.
   1.



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