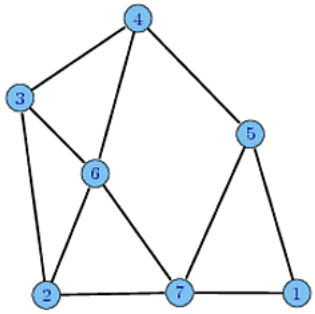
Math 107: Homework 7

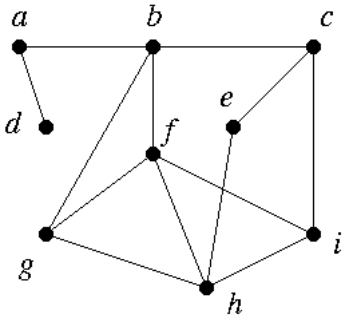
Due Tuesday, 4/25 start of class.

1. Count the numbers of vertices, edges and faces in the following figures.

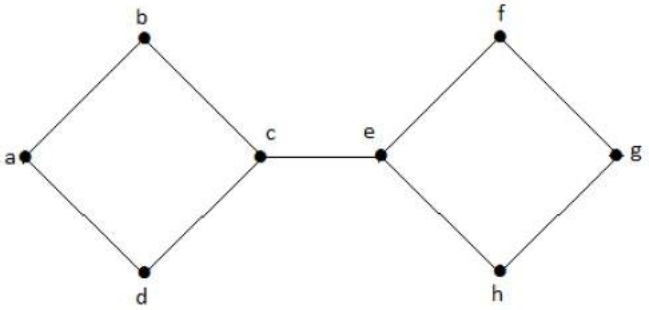
(a)



(b)

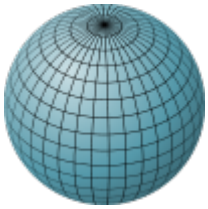


(c)



2. Do these graphs satisfy the Euler's characteristic, $V - E + F = 2$? Please show your computation.

3. In Topology, we often classify objects by counting the number of holes in them. For example, a sphere has no hole, a donut has 1. The formula that relates the Euler's characteristic and the number of holes is $V - E + F = 2 - 2H$, where H is the number of holes. Compute the Euler's characteristic for these objects:

(a) 

(b) 

(c) 

(d) 

4. Draw a graph and solve the murder case:

   Sherlock Holmes investigates about a murder that occured more than 10 years ago. Duke of Densmore was killed by the explosion of a bomb hidden in an armour in his bedroom. The testament also destroyed by this explosion, was said to damage one of his 7 ex-wives. However he had invited each of them in the castle at some time, for a few days. As the bomb was adjusted to fit in the armour, the murderess came in the castle several times. Each of them, interviewed by Holmes, swears that she went there only once. No one remembers, ten years after, the exact time when she went there. Holmes asks about who they met there:

   - Ann met Betty, Charlotte, Flicia, Georgia
   - Betty met Ann, Charlotte, Edith, Felicia, Helen
   - Charlotte met Ann, Betty, Edith
   - Edith met Betty, Charlotte, Felicia
   - Felicia met Ann, Betty, Edith, Helen
   - Georgia met Ann, Helen
   - Helen met Betty, Felicia, Georgia

   Which one was lying and hence is the murderess ?