

Homework 10

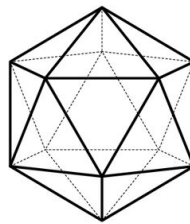
Due ***Monday, November 12*** at the beginning of class

Reading. Sections 8.1, 8.2, 8.3

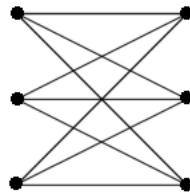
Remark. Make grammatically correct sentences by adding in just a few English words.

Problems.

1. Suppose we have a polyhedron that is a triangulation of the sphere with 57 vertices and 84 edges. How many faces must it have?
2. Is the “icosahedron graph” drawn below planar? If so, draw it as a planar map (with no edges crossing). If not, explain why not.



3. Is it possible to remove any nine edges from K_8 , the complete graph on 8 vertices, and obtain a planar graph? If so, draw such a graph as a planar map (with no edges crossing). If not, explain why not.
4. Prove that the graph $K_{3,3}$ drawn below is not planar. You are not allowed to cite Kuratowski’s Theorem which I mentioned in class — I am asking you to prove a special case of this theorem.



Hint 1: Observe that there are no triangles (cycles of length 3) in the graph. Hence we can mimic the proof of Theorem 12.2.2, except now each face has at least 4 edges on its boundary (since there are no triangles).

Hint 2: If you get stuck, see Exercise 12.2.2 and its solution in our book.