COMP9020 18s1

Week 7 Problem Set
Graphs and Trees

Foundations of Computer Science

[Show with no answers] [Show with all answers]

1. (Graph and tree properties)

   True or false?

   a. The complete bipartite graph $K_{5,5}$ has no cycle of length five.

   b. If T is a tree with at least four edges, then $\chi(T) = 3$.

   c. Let C_n denote a cycle on n vertices. For all $n \geq 5$ it holds $\chi(C_n) \neq \chi(C_{n-1})$.

   d. It is possible to remove two edges from K_6 so that the resulting graph has a clique number of 4.

   [show answer]

2. (Tri-partite graphs)

   Consider the complete 3-partite graphs $K_{4,1,1}$, $K_{3,2,1}$, $K_{2,2,2}$.

   a. What is the chromatic number of each of these graph?

   b. Which of these graphs are planar?

   [show answer]

3. (Planar graphs)

   For what pairs of integers $i \geq j \geq 1$ are the graphs $K_{i,j}$ planar?

   [show answer]

4. **Challenge Exercise**

   What is the minimum number of edges that need to be removed from K_5 so that the resulting graph has a chromatic number of

   a. 3 ?
   b. 2 ?
   c. 1 ?

   [show answer]