Problem Sets

Graph Theory - MATH 247

October 15, 2019

1. Due Friday 9/13
   Read: Preface, Prologue, Chapter 1
   Turn in: Problems 2, 7, 9, 12, 19
   Note: In drawing the graphs from these problems, please draw such that structural characteristics are easily visible.

2. Due Friday 9/20
   Read: Chapter 2 and “Vertex-coloring edge-weightings: Towards the 1-2-3-conjecture” by Kalkowski, Karoński and Pfender
   Turn in: Problems 2, 7, 8, 13, 19
   Also do: Problem 6, Prove Theorem 2.3 using induction on the number of vertices

3. Due Friday 9/27
   Read: Chapter 3 and “Merlin’s Magic Square” by Don Pelletier (which you can find via MathSciNet)
   Turn in: Problems 5, 13, 17, 21, 23
   Apply the algorithm of Kalkowski, Karoński and Pfender to the graph made by an 8-cycle together with a chord joining two vertices at distance 2 along the cycle. Show the steps of the algorithm, that is, give the labellings of the graph as well as the final labelling.

   Install software on a laptop so that you can use LaTeX. See the instructions on the course webpage. If this is not possible, please let me know. You will be asked to use LaTeX to typeset at least one problem from each future problem set.

   Also do: Problem 22, 25, Prove that every graph with no odd cycles is bipartite using induction on the number of vertices.

4. Due Friday 10/4
   Read: Chapter 4
   Turn in: Problems 5, 10, 11(a), (c), 14, 19. (At least one of these problems must be typeset using LaTeX.)
Also do: 4, 11(c), 11(d), 15, find the Prüfer code of a given labelled tree, given a Prüfer code draw the labelled tree

5. Due Friday 10/18
   Read: Chapter 5
   Turn in: 2, 8, 13, 17
   Also do: Apply Dijkstra’s algorithm to a weighted graph; TBA question about De Bruijn graphs; State and prove a characterization of Eulerian digraphs (recall the definition of strongly-connected);

6. Due Friday 10/25
   Read: Chapter 6
   Turn in: 6, 9, 13, Prove Theorem 6.3