Chapter 1. Basic Graph Theory
Study Guide

The following is a brief list of topics covered in Chapter 1 of Hartsfield and Ringel's *Pearls in Graph Theory: A Comprehensive Introduction* (Academic Press, 1994). This list is not meant to be comprehensive, but only gives a list of several important topics. You should also carefully study the proofs given in class and the homework problems.

Section 1.1. Graphs and Degrees of Vertices.
Graph, vertices, edges, finite graph, infinite graph, representations of graphs (i.e., drawings), representations of molecules using graphs/chemical graph theory, multigraph, loop, pseudograph, in this book "graph" means "simple graph," adjacent vertices, neighbors, vertex incident with an edge, edge incident with a vertex, degree of a vertex, isolated vertex, end vertex, sum of degrees is twice the number of edges (Theorem 1.1.1/Handshaking Lemma), degree sequence, a graphic sequence of non-negative integers, Theorem 1.1.2 on graphic sequences and its applications.

Section 1.2. Subgraphs, Isomorphic Graphs.
Subgraph, isomorphism between two graphs, Petersen graph, complete graph K_n, complete bipartite graph $K_{m,n}$, graphs based on platonic solids, path, length of a path, vertices connected by a path, cycle, length of a cycle.

Section 1.3. Trees.
Connected graph, Theorem 1.3.1 (a property of connected graphs), tree, forest, Theorem 1.3.2 (relationship between the number of vertices and the number of edges in a tree), Theorem 1.3.3 (a condition which implies a graph is a tree), Theorem 1.3.4 (end vertices of a tree), Theorem 1.3.A (a condition that implies two cycles as subgraphs), Theorem 1.3.5 (a classification of trees), spanning subgraph, spanning tree, Theorem 1.3.6 (every connected graph contains a spanning tree).

Revised: 11/20/2022