

Chapter 1. Graphs

Note. In the first two sections of this chapter (“1.1. Graphs” and “1.2. Subgraphs”) we briefly review introductory ideas from graph theory. In Section 1.3 (“Automorphisms”) we consider automorphisms and automorphism groups of graphs, and in Section 1.4 (“Homomorphisms”) we define a graph homomorphism and relate it to proper vertex colourings and associate the chromatic number to certain homomorphisms. In Section 1.5 (“Circulant Graphs”) we define circulant graphs as a generalization of cycles. In Section 1.6 (“Johnson Graphs”) we define a class of graphs based on combinatorial ideas, which includes Johnson graphs, Kneser graphs, and the Petersen graph. We give a result concerning the automorphism group of the class of graphs. Section 1.7 (“Line Graphs”) reviews line graphs, valency (“degree”), and cliques, and gives a few properties of line graphs. In Section 1.8 (“Planar Graphs”) we informally discuss planar graphs (a topic more appropriate for the area of topological graph theory); duals of a graph, orientable and non-orientable surfaces, and embeddings are mentioned.

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