

Chapter 11. The Four-Colour Problem

Study Guide

The following is a brief list of topics covered in Chapter 11 of Bondy and Murty's *Graph Theory*, Graduate Texts in Mathematics 244 (Springer, 2008). 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 11.1. Colourings of Planar Maps.

De Morgan's letter to Hamilton, Alfred Kempe's incorrect proof, Peter Tait makes connection between face colourings and edge colourings, Percy Heawood finds Kempe's error, Kenneth Appel and Wolfgang Haken's proof, discharging rules, reducible configuration, Robertson/Sanders/Seymour/Thomas simplified version of proof using Appel and Haken's ideas, Face Version of The Four-Colour Conjecture (Conjecture 11.1), The Four Colour Theorem (Theorem 11.2), k -vertex colouring, proper (vertex) colouring, k -colourable, Vertex Version of The Four-Colour Conjecture (Conjecture 11.3), The Four-Colour Conjecture in terms of 3-connected cubic plane graphs (Note 11.1.A), k -edge-colouring, proper edge colouring, k -edge-colourable, Tait's Theorem (Theorem 11.4), Edge Version of The Four-Colour Conjecture (Conjecture 11.5).

Section 11.2. The Five-Colour Theorem.

The Five-Colour Theorem (Theorem 11.6) and its proof.

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