Reading
January 22 : Sections 3.2, 3.3, and 3.5
January 24 : Sections 4.1 and 4.2
January 29 : Sections 4.3 and 4.4
January 31 : Section 4.5

Homework #3. due Thurs, 1/31/2013: Chapters 2 and 3.
Hand in exercises 2.15, 2.22*, 2.24, 2.26*, 2.30*, 3.3.
Graduate exercises 2.23*, 3.4.
Notes
* 2.22 should read ”... every regular simple graph is regular”.
* 2.23 should read ”Show that if a simple graph $G$ on $n > 1$ vertices...”.
* 2.26 The second sentence should read ”Viewing these paths as subgraphs of $G$, show that $p_1 \Delta p_2$ constitutes an edge-disjoint union of one or more cycles, possibly along with some isolated vertices.”
* 2.30 should read ”simple contraction” instead of ”contraction” in both places.

Second week summary
Tue 1/15. Handout 2. Went over some of the upcoming homework problems. Bipartite graph, bipartite $\iff$ all cycles have even length; converse ? Regular graph. Notations $N_n$, $P_n$, $C_n$, $K_n$. A 64-vertex graph associated with the $8 \times 8$ chessboard, and its degree census. Reviewed definition $G = (V, E, \phi)$ and what the “missing” $\phi$ is with the simple graph $G = (V, E)$. We observed that to define a digraph it is only necessary that the range of $\phi$ be changed from the power set $P(V)$ to the Cartesian product $V \times V$. Reviewed isomorphism as a pair of bijections with certain properties. Remarked that a homomorphism is the same, except the requirement that the two maps be bijections is dropped. Addressed these two questions: “how do I decide if two given graphs are isomorphic ?”, and “why is graph isomorphism important ?”
In answering the second, the fact that computers are needed to handle large graphs, and this raises the problem of how to store the graph in the computer’s digital memory. A frequently used method is by the technique of adjacency lists: a list of the vertices, and associated with each one a list of its neighbors. You should be able to pass between a graph presented in a picture and its adjacency list presentation. Went over Observation 2.22 on page 46.

Thu 1/17. Asked for questions from audience. Recommended everyone look at problem 2.16, more visual isomorphism trials. We took up some terminology/concepts: subgraph, induced subgraph, contraction of an edge, simple contraction of an edge, contraction of a graph, minor of a graph. We looked at Problem 2.34, and asked class to see if they understand what is being asked in Problem 2.36. These both involve the concept of minor.

We closed with this observation: If two quadratic polynomials are different, then one of them will be strictly larger from some point on. Consequently, there can be at most one quadratic polynomial \( q(n) \) which agrees with a given function \( m(n) \) for infinitely many values of \( n \). Tuesday: see relevance to problem 1.20 on page 28.

We had some topics to revisit next Tuesday:

1. Problem 1.20
2. Problem 2.16
3. Understand the definition of MINOR
4. Is every connected subgraph of \( G \) a minor of \( G \)? Is every connected subgraph of \( G \) a contraction of \( G \)?
5. Have a second look at Problems 2.34, 2.36 – the Robertson-Seymour minor theorem.