MA415 Exam #2
Review

1. Exam #2 will take place in class on November 5 and will cover material starting with the Matrix Tree Theorem through Section 2.2 and Finite Differences.

2. Section 1.3.4. Matrix Tree Theorem. Know the statement of the theorem and be able to carry it out for very small graphs (for which it is not burden to compute determinants by hand).

3. Section 1.4.2. Eulerian Trails and Circuits. Know the difference between an Eulerian trail and an Eulerian circuit. Know the definition of an Eulerian graph. Be able to prove that if a graph has an Eulerian trail, then it is connected and has at most two vertices of odd degree. Be able to prove that if a graph has an Eulerian circuit, then it is connected and every vertex has even degree. Know how to carry out the algorithm we discussed in class (involving a stack) to find an Eulerian circuit.

4. Section 1.4.3. Hamiltonian Paths and Cycles. Know the difference between a Hamiltonian path and a Hamiltonian cycle. Know the definition of a Hamiltonian graph. Be able to find Hamiltonian paths and cycles in small graphs by hand.

5. Sections 1.5.1–1.5.2. Planarity. Know the definition of a graph being planar. Be able to draw planar representations of small graphs. Know the proofs of Theorems 1.31, 1.32, 1.33, 1.34, and 1.35.

6. Section 1.5.3. Regular Polyhedra. Know the definition of a regular polyhedron. Know the proof of Theorem 1.36. Be able to describe the five regular polyhedra.

7. Semiregular Polyhedra. Refer to my posted notes. Know the definition of a semiregular polyhedron. Know how to derive the formulas for F_p, E, and V (but you do not need to memorize them). Know how to apply these formulas to determine the number of vertices, edges, and polygons of each type from the given vertex sequence. Know how to prove that a given vertex sequence is not valid for a semiregular polyhedron.

8. Section 2.1. Know how to derive the formulas for Problems 1, 2, and 3. Know how to solve some basic counting problems.

9. Section 2.2. Know how to prove Expansion, Symmetry, Addition, and the Binomial Theorem.

10. Finite Differences. Given a sequence $f(0), f(1), f(2), \ldots$ determined by a polynomial function f, know how to apply the procedure discussed in class to construct a formula.

11. Know how to do the homework problems in homework assignments #6 and 7.