MA515 Final Exam Topics

You should be familiar with all of the definitions, examples, theorems, etc. But here are the specific theorems that you should know the proofs for, and the specific algorithms that you should be able to carry out.

- Theorems and Proofs
  1. From my notes
     (a) Theorems of the Alternatives, Theorems 5.2 and 5.3
     (b) Weak Duality, Theorem 7.1
     (c) Duality, Theorem 7.11
     (d) Complementary Slackness, Theorem 7.16, Corollaries 7.17, 7.18
  2. From the book
     (a) Weyl's Theorem for Polytopes, p. 11
     (b) Minkowski's Theorem for Polytopes, p. 30
     (c) Unimodularity Implies Integrality, p. 41
     (d) Circuit Elimination, p. 52
     (e) Greedy Optimality for Matroids, p. 57
     (f) Matroid Intersection Duality Theorem, p. 99
     (g) Berge's Theorem, p. 107
     (h) Matching Duality Theorem, p. 113
     (i) Max-Flow Min-Cut Theorem, p. 146
     (j) König's Theorem, p. 44. You should be able to prove this four different ways: using total unimodularity, matroid intersection, the max cardinality matching algorithm, or the max-flow min-cut theorem

- Algorithms
  1. From my notes
     (a) Fourier Motzkin Elimination
     (b) Be able to write the dual of a general linear program
     (c) Simplex Method
     (d) Revised Simplex Method
  2. From the book

(a) Greedy Algorithm, Section 1.4
(b) Be able to construct the dual matroid of a given matroid, Section 1.6
(c) Be able to write down the inequalities for the Matroid Polytope, p. 67
(d) Dijkstra's Algorithm, Section 2.3
(e) Matroid Intersection Algorithm, Section 3.2
(f) Be able to write down the inequalities for the Matching Polytope, p. 109
(g) Maximum Cardinality Matching Algorithm, Section 4.3
(h) Max-Flow Min-Cut Algorithm, Section 5.1