MATH 250 FINAL EXAM REVIEW SHEET

Chapter 2. First order equations

- **Integrating factor (2.1)**

- **Separable equations (2.2)**
  - Review exlicit form of solution for IVP
  - Review integration (see #7 on Exam 1)

Chapter 3. Second order linear equations

- **Linear equations with constant coefficients (3.2, 3.4, 3.5)**
  - Characteristic equation and its roots
  - Finding general solution for all cases (see summary p.165)

- **Reduction of order (3.5)**

- **Method of undetermined coefficients (3.6)**
  - Finding the form of a particular solution (see table p.175)
  - Determining coefficients in the particular solution
  - Finding the general solution of a nonhomogeneous equation

- **Mechanical vibrations (3.8, 3.9)**
  - Setting up and solving free or forced spring-mass system
  - Review methods for finding k and γ
  - Review "beat" vs. resonance

Chapter 6. Laplace transform

- **Solution of IVP (6.2, 6.4)**
  - Make sure you know how to use the Table on p.304 (it will be provided)
  - Review partial fractions, factoring and completing the square techniques

- **Step functions (6.3)**
  - Review definition of a step function, finding values of piecewise cts functions
  - Taking direct and inverse Laplace trasform of functions given in terms of step functions
  - Remember that e.g. $L(tu_2(t)) \neq L(t) \cdot L(u_2(t))$! Review formula 13 from the Table.
  - Make sure you know how to solve ##7-18 on p.314, ##1-13, p.321

Chapter 7. Systems of ODEs

- **Equivalence of an n-th order ODE and a system of n 1st order ODEs (7.1)**
  - Review techniques of converting system into a single equation and back

- **Solving homogeneous linear systems with const coefficients (7.5, 7.6)**
  - Finding eigenvalues and eigenvectors of a 2x2 matrix
  - Writing general solution for distinct real and complex roots (in real-valued functions)
  - Solving IVPs
  - Classification of critical points (node, saddle or spiral) and stability
  - Basic strategies in graphing phase portraits