

REVIEW SHEET FOR FINAL EXAMINATION MATH 2280-2

The final is comprehensive and includes the following material:

- §1.1–1.5: Slope fields. Separable equations, linear first order equations. Population models, velocity-acceleration models and tanks.
- §2.1–2.6: Equilibrium solutions, stability and phase portraits (diagrams).
- §3.1–3.6: Existence and uniqueness theory for linear DEs. Solution of homogeneous and non-homogeneous linear differential equations. Mechanical applications, damped and undamped springs. Resonance.
- §4.1, §4.3: Systems of DE's. Converting an n-th order system of DE's into a first order system of DEs. Existence and uniqueness theory for systems of DEs.
- §5.1–5.6: Matrix exponential for solving first order linear homogeneous systems of DEs. Second order systems (systems of springs and masses).
- §6.1–6.4: Phase portraits, critical points. Study of critical points from the linearization around a critical point. Models of interacting populations and non-linear mechanical systems.
- §7.1–7.5: Laplace transform. Table of transforms that are needed will be provided, however you could be asked to rederive entries in the table. Laplace transform for systems and for studying resonance in mass-spring setups.
- §9.1–9.5: Fourier coefficients and series. The particular cases of odd (sine series) or even (cosine series) periodic functions. Study of mass-spring systems using Fourier series method (including resonance). Solution of the one-dimensional heat equation with separation of variables.

The following material is excluded from the final: numerical methods, variation of parameters, chains (appearing in the solution to first order linear homogeneous systems) and convolution solutions obtained via the Laplace transform method.