

Math 2552 Midterm 2
Incomplete list of topics

Here's a list of topics you should feel comfortable with as you prepare for midterm 2. I make **no assurances** that this list is exhaustive — anything we've covered in class through November 8 is fair game — but it should be a very good starting point for your studying.

Chapter 4

- Be able to write a second-order ODE as a first-order system of ODEs.
- Know how to find the general solution of a homogeneous, linear ODE with constant coefficients of any order.
- For homogeneous, linear ODEs with constant coefficients of second order, be able to draw a phase portrait.
- Know how to model spring-mass systems with viscous damping, including forced systems.
- Understand the qualitative differences between underdamped, critically damped, and overdamped systems, and know how to determine which of these applies to a given system.
- Be able to put solutions to spring-mass systems into phase-amplitude form, and know the vocabulary that surrounds this discussion. (See the day 14 notes.)
- Know how to solve some non-homogeneous ODEs using the method of undetermined coefficients. (And know which ODEs you can solve this way.)
- Know how to compute the frequency response function and gain of a system, and how to find the resonant frequency of a system.
- Know how to use variation of parameters to solve 2×2 systems of ODEs and second-order, linear ODEs.

Chapter 5

- Be able to compute the Laplace transform of a function from the definition. This includes determining the domain of the Laplace transform.
- Be able to determine Laplace transforms and inverse Laplace transforms using the table on page 313 of the textbook. This includes using partial fraction expansions to rewrite functions until the table can be used.
- Be able to compute Laplace transforms of step functions, indicator functions, and periodic functions.
- Be able to solve an IVP or linear system using the Laplace transform. Here, the forcing term could have any of the forms described above.