

### To do List

1. Check solutions to worksheet 03/27
2. Watch video on the variation of parameters for the general second order problems and take detailed notes.
3. Attempt problem 1 below.
4. Watch the video on modeling the spring-mass system and take detailed notes
5. Attempt problem 2 below.

**NOTE:** I will not collect the worksheet problems. These problems are meant to check your understanding and generate questions to ask me during office hours if you get stuck.

### Objectives

By the end of this lecture you should be able to

1. Use the **variation of parameters** technique to find a particular solution of a second order non-homogeneous ODE with non constant coefficients given a fundamental set of solutions.
2. Understand how a second order ODE with constant coefficients describes the motion of a spring-mass system.

### Problems

1. Find the general solution of

$$t^2 y'' - 3ty' + 4y = t^2 \ln(t)$$

give that  $y_1(t) = t^2$  and  $y_2(t) = t^2 \ln(t)$  satisfy the homogeneous problem.

2. A mass of  $\frac{1}{2}$  is attached to a spring with spring constant  $k = 2\frac{kg}{s^2}$ . The spring is pulled down an additional  $1m$  and released. Find the equation of motion if the damping constant is  $\gamma = 2\frac{kg}{s}$ .

### Additional Reading/ Examples

Section 3.6 pages 143 -146