Introduction

Constant coefficient linear DE's lie at the heart of this course. In this session will see that they can be used to model many physical systems. Here we will focus on the damped harmonic oscillator. In particular we will discuss spring-mass-dashpot systems

Because second order equations are algebraically tractable we will focus on them. Fortunately they are varied enough to give us a lot of insight into the behavior of higher order systems.

In this session we will learn how to solve homogeneous equations, i.e. those where the input function is 0. The key step will be finding which exponential functions e^{rt} satisfy the DE. These will be our *modal* solutions. We will use superposition to build all the solutions out of the modal solutions.

The algebra will demand that we allow r to be a complex number, so we will need to use Euler's formula to convert the complex exponential solution into solutions involving sines and cosines.

18.03SC Differential Equations
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