

18.03 Differential Equations: Week 6

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February 10th, 2020

Progress Update

Over the past week we have covered:

- 1 More on constant coefficient DEs
- 2 Autonomous Equations
- 3 Phase diagrams

Constant Coefficient DEs

We can solve two constant coefficient DEs much easier if the input (right side of standard form) is sinusoidal or of the form Ae^{rt} :

- 1 In case of exponential input, make an ansatz of the form $x = Ae^{rt}$ and solve for A.
- 2 In case of sinusoidal input, create an additional DE and manipulate to have equations add such that inputs make up Euler's formula.

Example Problem

2. Find a solution of $\dot{x} + 2x = \cos(2t)$ using *complex replacement*. Your work should also give you a solution for $\dot{x} + 2x = \sin(2t)$.

Autonomous Equations and Phase Diagrams

Autonomous equations are DEs of the form

$$\frac{dx}{dt} = f(x), \quad (1)$$

where the intuitive importance of this is that an initial input is what determines the course of the equation; consider the phase diagram

