8/30/2021 near Mather house

Lecture 29

11/12/2021

Second order Diff equations

Table of Contents

Second order systems

second order:

$$mx''(t) = F$$

Newton's law! the second derivative is especially important

Examples

Second Order Linear

$$x''(t) + 5x'(t) + 6x(t) = 0$$

Try: $x(t) = e^{rt}$

$$(r^2 + 5r + 6)e^{rt} = 0$$

So: r=-2 or r=-3

$$x(t) = Ae^{-2t} + Be^{-3t}$$

Example 1

$$x''(t) = x(t)$$

Example 2

$$x''(t) - 5x(t) + 6 = 0$$

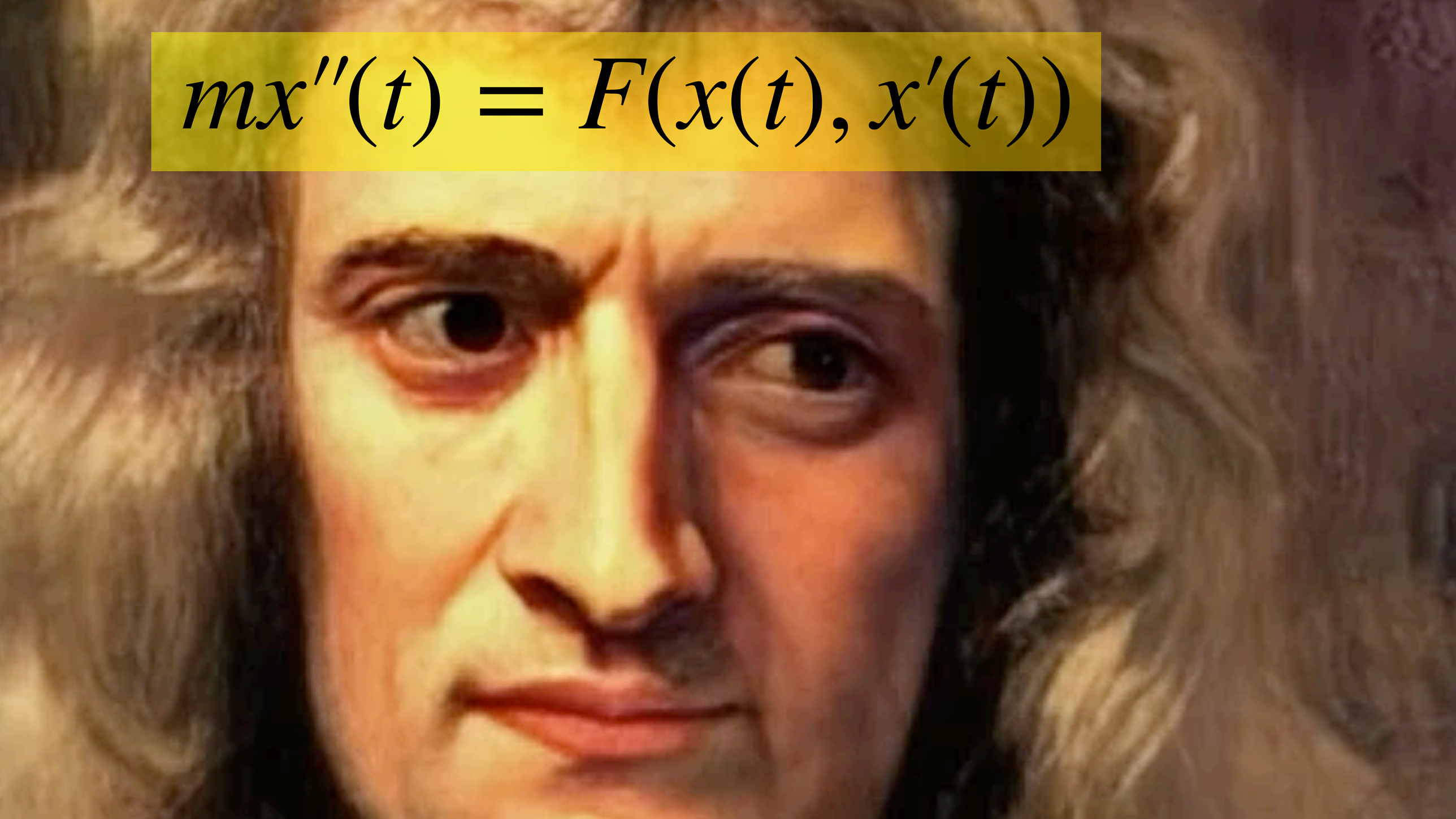
Example 3

$$x''(t) = -x(t)$$

Example 4

$$x''(t) + 2x'(t) + 2x(t) = 0$$

Interpretations

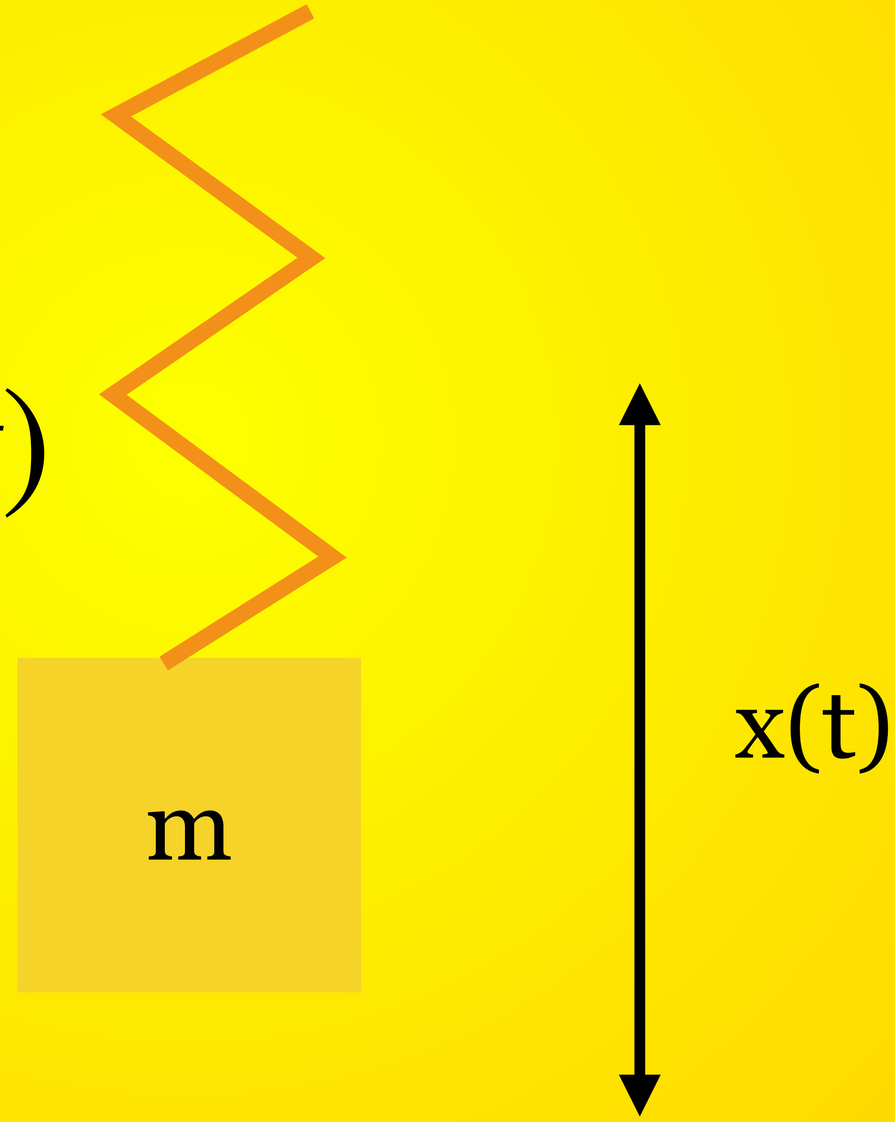

$mx''(t) = F(x(t), x'(t))$

Harmonic Oscillator

spring constant

$$mx''(t) = -cx(t)$$

mass



With Damping

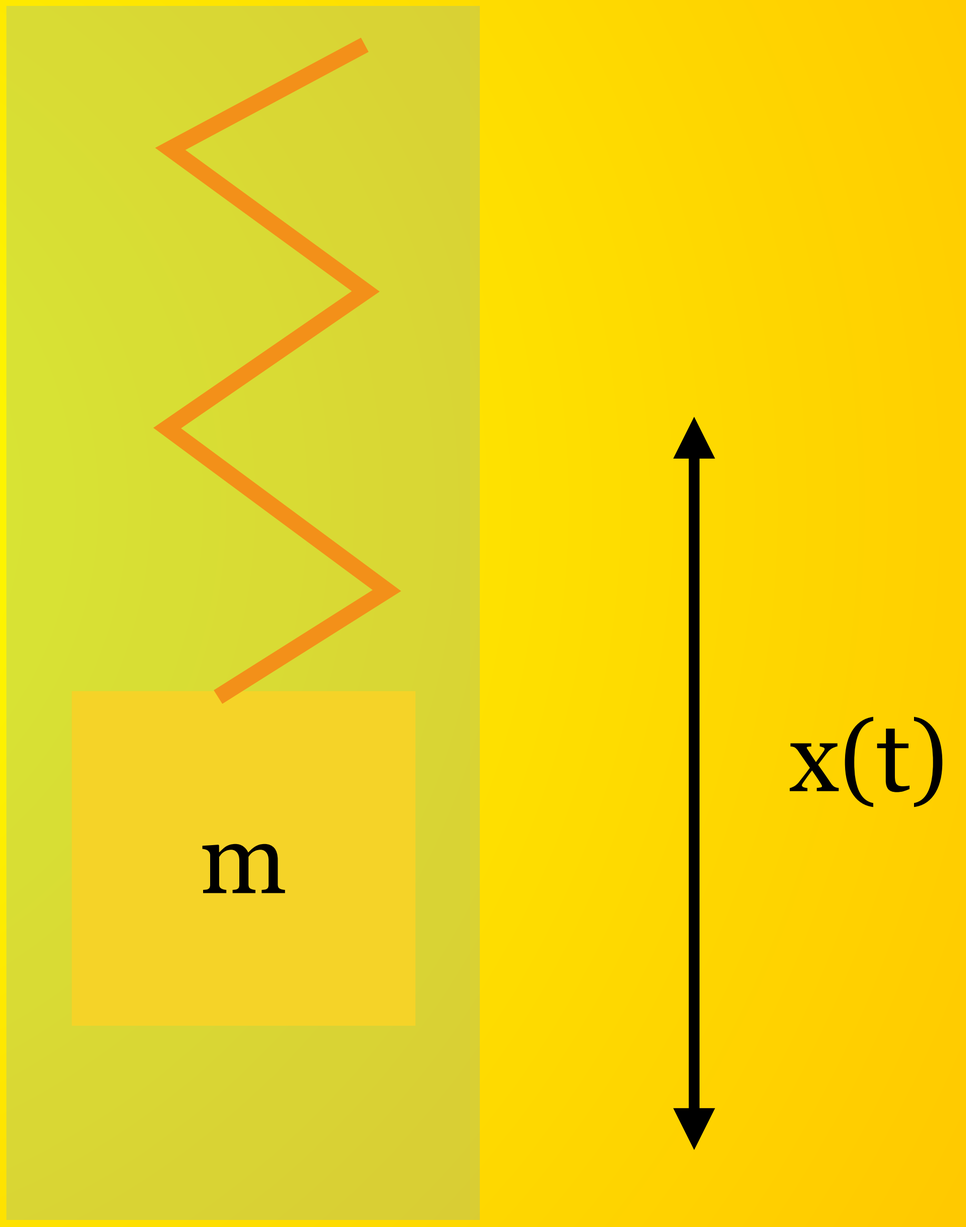
spring constant

$$mx''(t) = -bx'(t) - cx(t)$$

mass

damping

-> Monday lecture



Worksheet

Reminders

1) Point Recovery for second midterm

2) HW 27 due Monday

The End