Lecture 4.9: Variation of parameters for systems

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# Writing linear 2nd order ODEs as systems

A general 2nd order linear ODE

Consider $y'' + p(t)y' + q(t)y = g(t)$.

# A familiar example, as a system

### Example

Consider $ay'' + by' + cy = 0$, where $a, b, c$ are constants.

# Variation of parameters: the general method

### An old example

Solve the ODE: $y'' + y = \tan t$.

# Variation of parameters: the general method

## A new example

Solve the $2 \times 2$ system of ODEs: $\begin{bmatrix} x_1' \\ x_2' \end{bmatrix} = \begin{bmatrix} 1 & -4 \\ 2 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 10\cos t \\ 2e^{-t} \end{bmatrix}$.

# Variation of parameters: a special case

Revisiting the 2nd order linear ODE

Solve the ODE: $y'' + p(t)y' + q(t)y = g(t)$.