

## Problem 1

Convert the differential equation

$$y'' + 5y' + 6y = 0$$

into a system of first order (homogeneous) differential equations and solve the system. To check your answer, construct a differential operator whose kernel is spanned by fundamental solutions to this differential equation.

## Problem 2

Convert the differential equation

$$y'' + 5y' + 6y = e^x$$

into a system of first order (nonhomogeneous) differential equations and solve the system.

### Problem 3

Convert the following into a system of linear equations (you don't need to solve the system):

$$y''' + 3y'' + 2y' + y = e^x$$

### Problem 4

Convert the following into a system of linear equations (you don't need to solve the system):

$$y_1'' + 3y_1' + y_2 = 0$$

$$y_2'' + 4y_2' + y_1' + y_2 = 0$$