

Differential Equations (92.236)

Homework Assignment #10 Spring 2007

Introduction: Higher-Order Linear Systems

Problem 1

Show that the individual solutions provided for the given ODEs do indeed satisfy the ODE. In addition, with the given ICs, determine a unique solution by finding appropriate values of the arbitrary coefficients in the general solution:

a. Given IVP: $y'' - 3y' + 2y = 0$ with $y(0) = 1$ and $y'(0) = 0$

Individual Solutions: $y_1(x) = e^x$ and $y_2(x) = e^{2x}$

b. Given IVP: $y'' - 10y' + 25y = 0$ with $y(0) = 3$ and $y'(0) = 13$

Individual Solutions: $y_1(x) = e^{5x}$ and $y_2(x) = xe^{5x}$

c. Given IVP: $y'' - 2y' + 2y = 0$ with $y(0) = 0$ and $y'(0) = 5$

Individual Solutions: $y_1(x) = e^x \cos x$ and $y_2(x) = e^x \sin x$

Problem 2

Determine if the given functions are linearly dependent or linearly independent. Explain.

a. $f(x) = \pi$ and $g(x) = \cos^2 x + \sin^2 x$

b. $f(x) = e^x \sin x$ and $g(x) = e^x \cos x$

Problem 3

Find the general solution to the following linear constant coefficient ODEs:

a. $y'' + 5y' = 0$

b. $4y'' + 8y' + 3y = 0$

c. $4y'' + 4y' + y = 0$