

NAME: _____

AM 033 — Applied Mathematics - I

Brown University
Homework, Set 7

Fall 2003
Due October 30

7.1 Write out the characteristic equation for the given differential equation

$$(a) \ y^{(4)} - 2y''' + y'' - 2y' = 0, \quad (b) \ (D^3 + 5D - 10)y = 0, \quad \text{where } D = d/dx.$$

7.2 The characteristic equation for a certain differential equation is given. State the order of the differential equation and give the form of the general solution.

$$(a) \ \lambda^2 + 2\lambda - 3 = 0, \quad (b) \ \lambda^3 - 2\lambda^2 + 2\lambda = 0.$$

7.3 Write the general solution of the differential equation

$$(a) \ y''' + y'' - 2y' = 0, \quad (b) \ 25y'' - 20y' + 4y = 0, \quad (c) \ y'' + y' + 1.25y = 0.$$

7.4 Solve the initial value problems

$$\begin{array}{ll} (a) \ y'' + 8y' - 9y = 0, & y(1) = 3, \quad y'(1) = -7; \\ (b) \ 16y'' + 24y' + 9y = 0, & y(0) = 1, \quad y'(0) = -11; \\ (c) \ 9y'' + 9y' + 2.5y = 0, & y(0) = 1, \quad y'(0) = -3/2. \end{array}$$

7.5 Find a second solution of the given Bessel equation

$$x^2 y'' + x y' + (x^2 - 0.25)y = 0, \quad x > 0, \quad y_1(x) = x^{-1/2} \sin x.$$