MATH6103 Differential & Integral Calculus
MATH6500 Elementary Mathematics for Engineers

Problem Sheet 8

Date: 9/11/2011

Due Date: 16/12/2011

Answer all questions marked with an asterisk (*).

1. Solve the following second order ordinary differential equations.

    (i) *
    $$y'' - 4y = 0$$

    (ii)
    $$y'' + y' - 2y = 0$$

    (iii) *
    $$y'' + 6y' + 9y = x^2 + 1$$

    (iv)
    $$4y'' - 4y' + y = \sin(x)$$

2. Solve the following initial value problems (IVP):

    (i)
    $$y'' + y' - 2y = e^x, \quad y(0) = 0, \quad y'(0) = 0$$

    (ii)
    $$y'' + 4y' + 3y = e^{2x} + x, \quad y(0) = 0, \quad y'(0)) = 0$$

    Solve the following boundary value problems (BVP):

    (iii)
    $$y'' - 4y' + 4y = 4e^{2x}, \quad y(0) = 1, \quad y(1) = e^2$$
    Hint: try $f(x) = ax^2 e^{2x}$ for the particular integral.

    (iv) *
    $$y'' + 2y' - 2y = e^{3x}, \quad y(0) = 1, \quad y(\pi/2) = e^{3\pi/2}$$

    (v)
    $$y'' + 2y' + 2y = x, \quad y(0) = 0, \quad y(\pi/2) = -1/2$$
    Hint: recall that we can write $e^(a + ib) = e^a[\cos(b) + i\sin(b)]$.