Assignment 2

1. Find a particular solution to the equation

$$y''(t) - 4y'(t) - 12y(t) = 3e^{5t}.$$

Then, find the solution to the same equation that obeys y(0) = 1, y'(0) = 0.

2. Find the general solution to the equation

$$y''(t) - 4y'(t) - 12y(t) = 2t^3 - t + 3$$

3. Find a particular solution to

$$y''(t) - 4y'(t) - 12y(t) = 3e^{5t} + \sin(2t).$$

4. Solve the initial value problem (IVP) using Laplace transforms:

$$y'' + 2y' - 15y = 6\delta(t - 9).$$

Here, δ is the Dirac delta function. y(0) = 0, y'(0) = 0.

5. Solve

$$y'' + y = 9 + u(t - 3)$$

with y(0) = 1, y'(0) = 0. Discuss the resultant solution to this forced harmonic oscillator problem.

- 6. Simmons, second edition. p.183, Hermite's equation, Q 7. Do all parts.
- 7. Simmons, second ed. p.191, Q1, Q2.
- 8. Simmons p. 191 Q 6. For the same equation, check if the point at infinity is a regular singular point.
- 9. Bessel's equation of order 1/2, of order 2 and of order zero in each case find how many Frobenius series solutions are there and find them. You have to get the general recursion formula and display the first 3 nonzero terms explicitly in such a solution. If a second Frobenius solution does not exist, find the behaviour of a second linearly independent solution close to x = 0.
- 10. Simmons, p.207, Q1b.