

Department of Mechanical Engineering
Indian Institute of Technology New Delhi

I Semester -- 2019 – 2020

MCL 704 *APPLIED MATHEMATICS FOR THERMOFLUIDS*

Problem Set 4: Reduction of Order Method for Second Order Linear ODEs

1. Verify that $y_1 = e^x$ is a solution of the homogeneous linear differential equation

$$y'' - y = 0$$

Using the method of reduction of order, find a second linearly independent solution and hence write the general solution of the given differential equation.

2. Verify that $y_1 = e^{-x}$ is a solution of the homogeneous linear differential equation

$$y'' - 2y' - 3y = 0$$

Using the method of reduction of order, find a second linearly independent solution and hence write the general solution of the given differential equation.

3. Verify that $y_1 = x$ is a solution of the homogeneous linear differential equation

$$(x^2 - 1)y'' - 2xy' + 2y = 0, \quad (|x| \neq 1)$$

Using the method of reduction of order, find a second linearly independent solution and hence write the general solution of the given differential equation.

4. Verify that $y_1 = x^2$ is a solution of the homogeneous linear differential equation

$$x^2y'' - 3xy' + 4y = 0, \quad (x > 0)$$

Using the method of reduction of order, find a second linearly independent solution and hence write the general solution of the given differential equation.

5. Verify that $y_1 = x^{-1/2}\sin x$ is a solution of the homogeneous linear differential equation

$$x^2y'' + xy' + \left(x^2 - \frac{1}{4}\right)y = 0, \quad (x > 0)$$

Using the method of reduction of order, find a second linearly independent solution and hence write the general solution of the given differential equation.