

Differential Equations

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October 11, 2023

1 Daily Quiz

Find a fundamental set of solutions to the homogeneous differential equation:

$$y''' - 2y'' + 2y' = 0.$$

2 Key Topics

Today, we review for Exam 2, which will cover the theory of second-order linear differential equations, the characteristic equation, the method of undetermined coefficients, and the method of variation of parameters.

2.1 Theory of Second-Order Linear Differential Equations

Every second-order linear differential equation can be written in the following form

$$y'' + p(t)y' + q(t)y = f(t).$$

You should be able to answer the following questions.

- When is a solution guaranteed to exist?
- When is the solution unique?
- What is a fundamental set of solutions?
- Give two formulas for the Wronskian. What is the importance of each?
- What is a particular solution?
- What is a general solution?

2.2 Characteristic Equation

Find a fundamental set of solutions to each of the homogeneous differential equations:

I. $y'' + 5y' + 6y = 0$

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

III. $y'' + 3y' + 4y = 0$

2.3 Undetermined Coefficients

Find a particular solution to each of the non-homogeneous differential equations:

I. $y'' + 5y' + 6y = 3e^{-2t}$

II. $y'' + 4y' + 4y = 5t + 3$

2.4 Variation of Parameters

Find a particular solution of the non-homogeneous differential equation:

$$y'' + 3y' + 4y = \frac{\sec(\frac{\sqrt{7}}{2}t)}{e^{3t/2}}$$

3 Exercises