MATHEMATICS

BEST PRACTICES

2021 - 2022

Certificate

This is to certify that this the work titled "methods of solution to second order linear differential equation with variable coefficients. of

students of Government Degree college, Alair submitted to the Department of mathematics as part of the students study project done under the guidance of. during the academic year

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Project Name :-

Methods of solutions to second order linear Differential equation with variable coefficients

Introduction :-

The general second order homogeneous linear differential equation with constant coefficients is

$$Ay'' + By' + Cy = 0,$$

where y is an unknown function of the variable x, and A, B, and C are constants. If $A = 0$ this becomes a first order linear equation. which in this case is separable, and so we already know how to solve. so we will consider the case A and 0. If we want, we can divide through by A and obtain the equivalent equation

$$y'' + by' + cy = 0,$$

where $b = B/A$ and $c = C/A$

linear with constant coefficients means that each term in the left Hand side of the equation is a constant times y or a derivative of y. Homogenous means that we exclude equations like

$$Ay'' + By' + Cy = f(x)$$

which can be solved, in certain important cases, by an extension of the methods we will study here. Here we only will solve the case where the Right Hand side $f(x)$ is identically 0. Homogeneous also means that the constant function $y = 0$ is always a solution to the equation

$y = C_1 \cdot f_1(x) + C_2 \cdot f_2(x)$. Now if $y = f_1(x)$ and $y = f_2(x)$ are indeed solutions, one can check by plugging in that $y = C_1 \cdot f_1(x) + C_2 \cdot f_2(x)$ will be a solution. The fact that all solutions are of this form, is harder to ascertain, but nevertheless true. Notice that of course we do need $f_1(x)$ and $f_2(x)$ to be independent. For ex + the functions $f_1(x) = -$ and $f_2(x) = 2e^x$ are not independent, because $f_2(x) = 2 \cdot f_1(x)$. On the other hand, for example the functions $g_1(x) = e^x$ and $g_2(x)$ are independent.

Statement of the problem

The study will try to solve the problem below:

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

$y'' + y' = 0$ and $x^2y'' + y' + xy = 0$ using power series and Frobenius method.

Aim and objectives of the study

The main Aim of the research work is determine the methods of solution to second order linear differential equation with variable coefficients. other specific objectives of the study are:

- To determine the solution around the origin + homogeneous and non-homogeneous second order differential equation with variable coefficients to determine the solution at other points

to investigate on factors affecting methods of solution to second order linear differential equation with variable coefficients

to determine the difference in efficiency of the methods of solution to second order linear differential equation with variable coefficients

Significance of the study

The study on the methods of solution to second order linear differential equation with variable coefficients will be of immense benefit to the mathematics department in the sense that the study will determine the solution around the origin for homogeneous and non-homogeneous second order differential equation with variable coefficients

Scope of the study :

The study on the methods of solution to second order linear differential equation with variable coefficients will focus on two methods

Definition of Terms

ODE : Differential equation

Differential equation :- A differential equation is a mathematical equation that relates some function with its derivatives.

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