

ABSTRACT

EXISTENCE AND UNIQUENESS OF PICARD ITERATION FOR THE FIRST ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS

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Differential Equations is a branch of Mathematics that related directly in life. One type of differential equations used is linear ordinary differential equations. Numerical solution methods in ordinary linear equations is known Picard iteration. This iteration solve a linear ordinary differential equation by determining the approximation of the general solution by means of iteration. The existence of iterations and singularity, is the guarantee of this method can be used in an initial value problem of first order linear ordinary differential equations.

This study involves a continuous function as well as the initial value problem of a differential equation can be performed iterations and known approximations of the solutions generally. Then the sufficient conditions $|f(x, y_1) - f(x, y_2)| \leq L|y_1 - y_2|$ defined in the definition of Lipschitz to help ensure the existence of the Picard iteration by iteration $y(t) = y_0 + \int_{t_0}^t f(s, y(s)) ds$. Results of iterations for $n = 1, 2, 3, \dots \infty$ is an exponential power series will converge to the upper limit $\frac{C}{K}(e^{Kh} - 1)$ for any $C, K > 0$ and $h = \min(p, q)$; $p, q \in \mathbb{R}^+$. Furthermore, with the Gronwall inequality theorem, can be obtained uniqueness properties of Picard iteration for first order linear ordinary differential equations.

From these studies, a sufficient condition of a differential equation can be used Picard iteration is must have the initial value problem and a continuous function in $[0, \infty)$. Then Picard iteration ensure a presence of a general solution of a linear ordinary differential equations with a first order approximation solution in the form of an exponential power series .

Keywords: Differential equations, Picard iteration, existence, uniqueness, initial value problems, power series, Lipschitz.