

Existence and uniqueness condition for solution of special differential equation.

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Abstract

Differential Equation are heart of analysis. This subject is the nature goal of elementary calculus and the most important parts of mathematics for the understanding the physical science. Also it is the source of most of the idea and theories which constitute higher analysis.

In given proposition we see the existence and uniqueness condition of special type of differential equations. It's helps to find the number of solutions of differential equations.

Keywords: Real valued solution, unique real solution.

(Symbols) $|x|$ - modulus of x.

\in - belongs to.

\forall - for all

Propositions: 1) consider the differential equation $I \frac{dy}{dx} I + I y I + a = 0$,

$a \in \mathbb{R}$ then number of real valued solution of the differential equation are as follow.

Case 1: $a = 0$ then $y(x) = 0$ is any one real value solution.

Case2: $a < 0$ then differential equation has exactly two real valued solutions.

Case3: $a > 0$ then differential equation does not have any real valued so solutions.

2) Consider the differential equation $I \frac{dy}{dx} I + I y I + a = 0$,

$a \in \mathbb{R}$ then number of real valued solution of the differential equation passing through the point $(b, c) \in \mathbb{R}^2$

Case-I $a = 0$ $I \frac{dy}{dx} I + I y I = 0$, $y(b) = c$

- a) Has unique solution $\forall (b, c) \in \mathbb{R}^2$
- b) Has unique solution $\forall (b, c) \in \mathbb{R}^2$, $c \neq 0$

Case-II $a > 0$ Has no real solution $\forall (b, c) \in \mathbb{R}^2$

Case-III $a < 0$

- a) Has unique real solution $y(X) = a \forall (b, a) \in \mathbb{R}^2$
- b) Has unique real solution $y(X) = -a \forall (b, -a) \in \mathbb{R}^2$
- c) Has no real solution $y(X) = -a \forall (b, -a) \in \mathbb{R}^2, c \neq \pm a$

List of References books:

- i) A short course in ordinary differential equation.
- ii) Schaum's- outlines- differential equation.
- iii) Ordinary and partial differential equation.
- iv) Hand book of differential equation.
- v) Ordinary differential equation with application.

