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I'D	7878
Section	A
Subject	Differential equation.
Assignment	1

Odinary Differential Equation.

-> An equation contains only ordinary derivates of one or more dependent variables of a single indenpendent variable

For exp::

$$\frac{dy}{dx} + \hat{s}y = e^x, \left(\frac{dx}{dt}\right) + \left(\frac{dy}{dt}\right) = 2x + y$$

-> An odinary differential equation is a differential equation in which the unknown function (also known as the dependent variable) is a function of a or single independent varible in the Simplest from the unknown function is a real or complex valued function but more generally it may be vector valued or matrix valued the corresponds to considering a system of ordinary differential equation for a single function ordinary differential equation are further dependent variable appearing in the equation. the most important cases for application are first order and second order differential equation in the classical literature also distinction is made between differential equations explicitly solved with respect. to the highest derivative and differential equation in an implicit from.

-> An ordinary differential equation in an equation that involves some ordinary derivatives as opposed to partial derivatives of a function Often our goal is to solve an ODE i-e determine what function or functions satisfy the equation. if you know what the derivative of a function is how can you find the function itself you need to find the antidervative you need to integrate $dx/dt(t) = \cos t$

ODE's Application's:-

-> modelling with first order equation.
 i) Netwon's law of cooling.
 ii) electrical circuits.

-> modelling free mechanical osillations:-
 i) No damping.
 ii) light damping.
 iii) Heavy damping.

-> modelling forced mechanical oscillations.

-> computer exercise or Activity.

-> Beam.

-> physical Application.

-> Radio Active elements.

-> electrical circuits.

-> computer exercise.

-> modelling with First order equations.

-> physical Application of ODE.
 i) its velocity $(v) = \frac{dx}{dy}$
 ii) its acceleration $(a) = \frac{dv}{dt}$ or d^2x/dt^2 or $v\frac{dv}{dx}$.

if however the body be moving along a Curve then.

 i) its velocity $(V) = \frac{ds}{dt}$ or $v\frac{dv}{ds}$ or d^2s/dt^2

-> NEWTON'S SECOND LAW.

The Rate of change in momentum encountered By A moving object. is equal to the Net force Applied to in mathematical terms.

$$F = \frac{d(mv)}{dt} \rightarrow m\frac{dv}{dt} + v\frac{dm}{dt} \longrightarrow F = m\frac{dv}{dt} = \boxed{F = ma}$$

Partial differential equation:

An equation contains partial derivates of one or more dependent variables of two or more independent variables.

for exp:-

$$\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial t^2} = 2\frac{\partial U}{\partial t}$$

-> A partial differential equation is a differential equation in which the unknown function is a function of multiple independent variables and the equation involves its partial deivatives the order is defined Similarly to the case of ordinary differential equations but further classification into elliptic hyperbolic and parabolic equations especially for Second order linear equation is of utmost importance Some partial differentail equations do not fall into any of these categories over The whole domain of the independent variable and they are Said to be of mixed type.

-> A partial differential equation is a mathematical equation that involves two or more independent variables an unknown function (dependent on those Variables. and partial derivatives. of the unknown function with respect to the unknown function. independent variables the order of a partial differential equation is the order of the highest derivative involved A Solution (or a particular Soulation. to a Partial differential equation is a function that Solves the equation or in other word turns it into the equation A Solution. is called general if it contains all particular Solution The equation concerned The term exact Solution is often used for Second and higher order nonlinear PDEs to denote a particular Solution.

PDE's Applications

PDE's are used to model many Systems in many different field of Science and engineering.

-> laplace equation.

-> Heat equation.

-> wave equation.

-> partial differential equation are used to mathematically formulate and thus aid the Solution of physical and othe problems. involving function of several variables such as the propagation of heat or Sound

-> fluid.flow.

-> elasticity.

-> electrostatics.

-> electrodynamics. etc.

-> Because of their widespread application in engineering our Study of PDE Will focus on linear Second-order equation.

-> The following general from will be evaluated for B^2-4AC.

-> Applications are mostly Scientific and engineering calculation (eg - Solution of partial differential equation.

-> High level language such as Fortran and CoBol.