G.H RAISONI COLLEGE OF ENGINEERING AND MANAGEMENT.WAGHOLI.PUNE
An Autonomous Institute Affiliated To Savitribai Phule Pune University

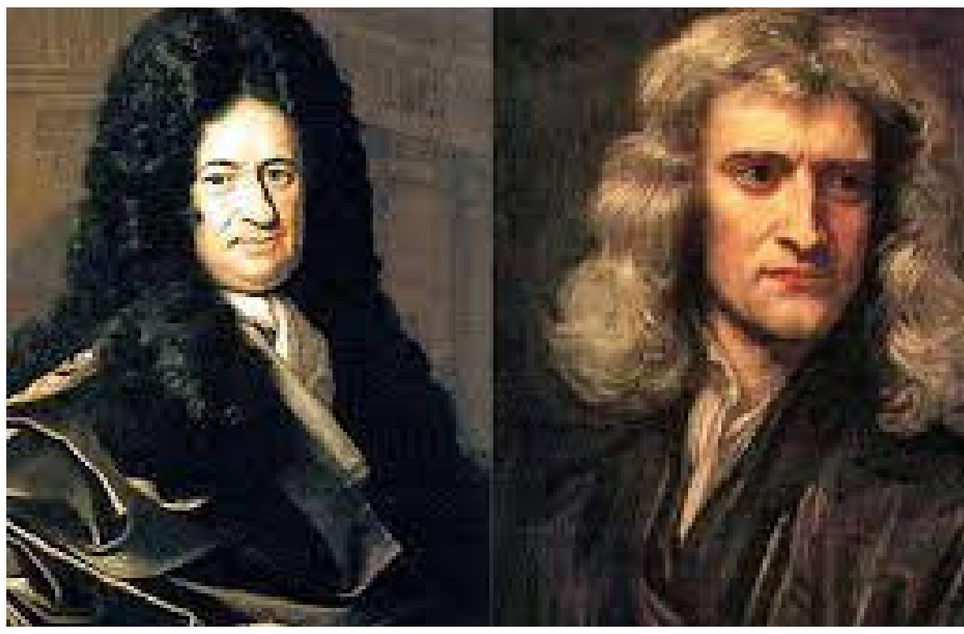
RAISONI GROUP
a vision beyond

APPLICATIONS OF DIFFERENTIAL EQUATIONS

IN MATHEMATICS, A DIFFERENTIAL EQUATION IS AN EQUATION THAT RELATES ONE OR MORE FUNCTIONS AND THEIR DERIVATIVES. IN APPLICATIONS, THE FUNCTIONS GENERALLY REPRESENT PHYSICAL QUANTITIES, THE DERIVATIVES REPRESENT THEIR RATES OF CHANGE, AND THE DIFFERENTIAL EQUATION DEFINES A RELATIONSHIP BETWEEN THE TWO. SUCH RELATIONS ARE COMMON; THEREFORE, DIFFERENTIAL EQUATIONS PLAY A PROMINENT ROLE IN MANY DISCIPLINES INCLUDING ENGINEERING, PHYSICS, ECONOMICS, AND BIOLOGY.

Invention Of Differential Equation

In mathematics, the history of differential equations traces the development of "differential equations" from calculus independently invented by English physicist Isaac Newton and German mathematician Gottfried Leibniz.

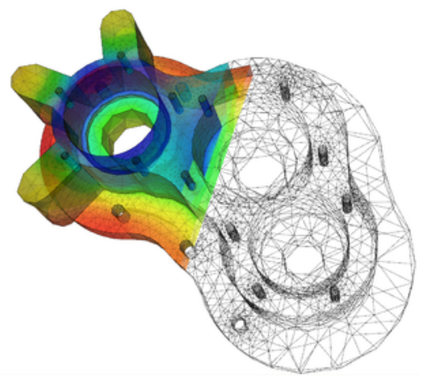


Isaac Newton listed three kinds of differential equations

$$\frac{dy}{dx} = f(x)$$

$$\frac{dy}{dx} = f(x, y)$$

$$x_1 \frac{\partial y}{\partial x_1} + x_2 \frac{\partial y}{\partial x_2} = y$$



Examples of differential equation

$$\frac{du}{dx} = cu + x^2.$$

$$L\frac{d^2u}{dx^2} + g\sin u = 0.$$

$$\frac{d^2u}{dx^2} - x\frac{du}{dx} + u = 0.$$

$$\frac{\partial u}{\partial t} + t\frac{\partial u}{\partial x} = 0.$$

$$\frac{d^2u}{dx^2} + \omega^2 u =$$

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0.$$

$$\frac{du}{dx} = u^2 + 4.$$

$$\frac{\partial u}{\partial t} = 6u\frac{\partial u}{\partial x} - \frac{\partial^3 u}{\partial x^3}.$$

Applications

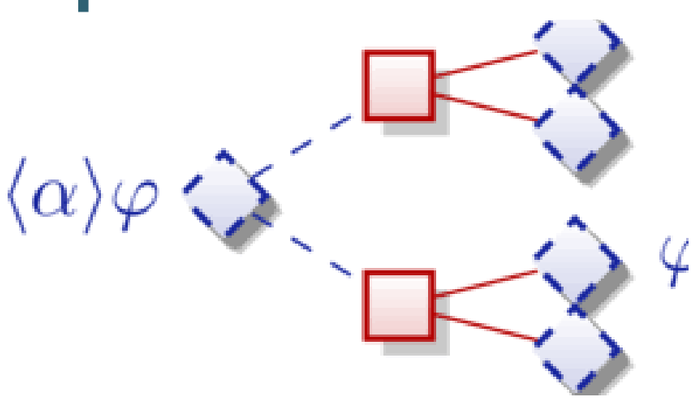
- ❖MODELLING WITH FIRST-ORDER EQUATIONS
  - Newton's Law of Cooling
  - Electrical Circuits
- ❖MODELLING FREE MECHANICAL OSCILLATIONS
  - No Damping
  - Light Damping
  - Heavy Damping
- ❖MODELLING FORCED MECHANICAL OSCILLATIONS
- ❖COMPUTER EXERCISE OR ACTIVITY

Applications of newtons laws of cooling

- Investigations.
  - It can be used to determine the time of death.
- Computer manufacturing.
  - Processors.
  - Cooling systems.
- solar water heater.
- calculating the surface area of an object.

Game app developement

Differential equation are greatly used in game development



In a simple video game involving a jumping motion, a differential equation is used to model the velocity of a character after the command is given to returning them to the ground in a simulated gravitational field.

C69 - SUSHMA DIPAK YEMMEWAR , C70 - SWAYAM PRAMOD TERODE , C71 - TANMAY RADHAKRISHNA ASWALE , C72 - VALLABH RAJARAM SHRIMANGALE
FACULTY NAME - PROF.PRAMOD YELAM