

ASSIGNMENT

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Subject : Differential equation

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Application of ODE's in engineering

★ The ODE's have wide application in various engineering and science.

It is practically important for engineering to be able to model physical prob and then solve these equations so that the behaviour of the system concerned can be studied.

★ Application of differential equations we present example where differential equation are widely applied to model natural phenomena, engineering system and many other situations.

Application of ODE's

- ① Newton law of cooling
- ② Errors
- ③ physical application
- ④ Radio active element
- ⑤ Electrical circuit
- ⑥ modeling free mechanical oscillations
- ⑦ no damping ∇
- ⑧ light Damping
- ⑨ Complete Exercise Activity
- ⑩ modeling with first-order equation = \odot

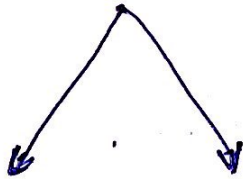
* Application of ODE's in engineering

Problem Solving

$$F = ma$$



$$\frac{dv}{dt} = g - \frac{c}{m}v$$



Analytical

numerical



$$v = \frac{g m}{c} (1 - e^{-\frac{c}{m}t})$$



$$v_{i+1} = v_i + (g - \frac{c}{m}v_i) \Delta t$$

Physical law

ODE



Solution

Application of PDE's in engineering.

→ In many other engineering or science problems such as heat transfer, elasticity, vibration, mechanics, water flow & other the problems are governed by partial differential equations.

→ by nature, this type of problem is much more complicated than the previous order.

⇒ There are several major methods for the solution of PDE

→ Including Separation of variables

→ method of characteristics

→ Superposition principle

→ Integral transform

→ Change of variables

→ Lie group method

⇒ Although the existence and uniqueness

of solution of ODE's is well

established, but that is not the case

for many PDE's. In fact analytical

Solution are not available for many PDE's which is well know fact, particularly when the solution domain is not regular or homogenous or the material properties change with the solution step.

Important example

PDE's are used to model many systems in many different fields of science and engineering

Example:

- * Laplace equation
- * heat equation
- * wave equation