Lecture Module - ODE Review

ME3050 - Dynamic Modeling and Controls

Mechanical Engineering

Tennessee Technological University

Topic 2 - Separation of Variables

Topic 2 - Separation of Variables

- Review

- Separation of Variables

- Example

What is a Differential Equation? Solution?

A **differential equation** is an equation which describes a function

and one or more of its _____ of the

_____ _____

with respect to the _____.

The **solution** to a differential equation describes the

_____ _____ as a function

of the _____ _____.

Problem Statement

Remember our example from the previous lecture?

$$\dot{v} + \frac{c}{m} v = f(t)$$

We are going to find an **analytical solution** to this problem.

Separation of Variables

This is an **analytical** method that you learned in calculus.

Assume the external force $f(t)$ is zero. Re-write then separate.

$\dot{v} + \frac{c}{m} v = 0$

Solution

The solution $v(t)$ has been found. What does it mean? What do we do next?

$v(t) =$

Graph of Solution

What does the solution look like?

$$v(t) = v_0 e^{-\frac{c}{m}t}$$