ME 3001 Lecture, Ordinary Differential Equations
A Brief Review of to Begin

- **What is a Differential Equation?**
  - An equation describing a function and one or more of its derivatives of the dependent variable with respect to the independent variable.

  - Dependent Variable

  - Independent Variable

- **Standard form of a O.D.E.**

$$a_n \frac{dy^{(n)}}{d^{(n)}x} + a_{n-1} \frac{dy^{(n-1)}}{d^{(n-1)}x} + \ldots + a_2 \frac{dy^2}{d^2x} + a_1 \frac{dy}{dx} + a_0 = f(x)$$

$$a_n y^{(n)} + a_{n-1} y^{(n-1)} + \ldots + a_2 y'' + a_1 y' + a_0 = f(x)$$

- **Classification of Ordinary Differential Equations**

  – Ordinary or Partial

  – Homogeneous or In-Homogeneous

  – Order of the Equation

  – Linear or Non-Linear

    * 1)

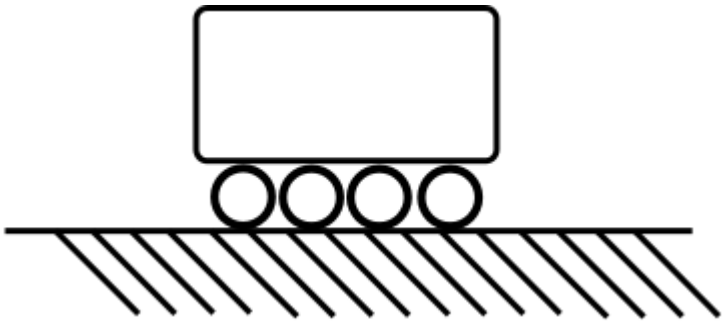
    * 2)

  – Degree of the Equation

- **Classification Examples**

- **Differential Equations in Engineering**
  - **The Study of how physical quantities vary with respect to each other in space and time.**
  - Dynamics
  - Heat Transfer
  - Vibrations
  - Possibly the Most Common ODE in Engineering...

- **A Mechanical Engineering Example**



- **Derivation of the O.D.E.**

- **Solution of the O.D.E.**

- **What does it look like?**