

What is a Differential Equation?

Aim

To introduce the concept of a differential equation.

Learning Outcomes

At the end of this section you will:

- Understand what a differential equation is,
- Know how to represent a differential equation.

A **differential equation** is an equation that involves one or more derivatives of an unknown function. Solving the differential equation means finding a function (or every such function) that satisfies the differential equation. Many of the fundamental laws of physics, chemistry, biology and economics can be formulated as differential equations.

An ordinary differential equation (ODE) is a differential equation in which the unknown function is a function of a single independent variable. All the differential equations dealt with in this course will be ODEs.

Example

$$\begin{aligned}\frac{dy}{dx} &= 7 \\ \frac{d^2y}{dx^2} - \frac{dy}{dx} + y &= 0 \\ \frac{d^3f}{dt^3} + \frac{df}{dt} - 3f &= 7t\end{aligned}$$

Related Reading

Stewart, J. 1999. *Calculus*. 4th Edition. Brooks/Cole Publishing Company.

Jacques, I. 1999. *Mathematics for Economics and Business*. 3rd Edition. Prentice Hall.