Differential Equations

2nd-stage-chemistry

Lecture 5

2021-2022

Integrating Factor

Integrating factors are useful for solving ordinary differential equations that can be expressed in the form

$$\frac{dy}{dx} + p(x)y = f(x) \dots \dots \dots \dots \dots . (*)$$

The basic idea is to find some function , say $I(x)$, called the "integrating factor" ,

Which we can multiply through equation (*) in order to bring the left-hand side under a common derivative . For the canonical first-order linear differential equation (*) , the integrating factor is $I(x) = e^{\int p(x)dx}$.

$$I(x)\frac{dy}{dx} + I(x)p(x)y = I(x)f(x)$$

$$I(x)y = \int I(x)f(x)$$

Examples

1) Solve $\frac{dy}{dx} + \frac{y}{x} = 2$

2) Solve $\frac{dy}{dx} - \frac{4y}{x} = x^5 e^x$

3) Solve $\frac{dy}{dx} - \frac{2y}{x} = 0$