

Lecture 18

Wednesday, February 12, 2025 12:41 AM

In general, it is tricky to solve a differential equation. A lot of times, a differential equation can only be solved numerically, not analytically. However, there are cases when differential equation can be solved analytically. Two such methods that we will explore in this course are:

- Separable of variables
- Integrating factor

A differential equation is in separable form if it is of the form

$$y' = \frac{dy}{dx} = f(x)g(y)$$

It has its name because you can separate x and y in the following way:

$$\frac{dy}{g(y)} = f(x)dx$$

Then you put the integral sign on both sides:

$$\int \frac{dy}{g(y)} = \int f(x)dx$$

You try to integrate each side and try to get y (as a function of x).

Note that the equation $y' + y = x$ is not in separable form, even though x and y are "separated".

Wrong solution:

$$\int (y' + y) = \int x$$

So, $y + \frac{y^2}{2} = \frac{x^2}{2} + C$. What is wrong with this solution?

Work on some examples in the worksheet.