

Separable Differential Equations

An equation involving a function and its derivative:

If $f(x) = g(x)H(y)$ we have a separable differential equation!

Separable Differential Equations

Example 1: Solve the differential equation

$$\frac{dy}{dx} = (1 + y)e^x$$

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Example 2: Solve the differential equation

$$\frac{dy}{dx} = e^{x-y}$$

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Example 3: Solve the differential equation

$$\frac{dy}{dx} = xy + 3x - 2y - 6$$

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The solution to a differential equation represents an infinite family of functions:

Specifying a point on the curve determines a particular one!

The combination is known as an initial value problem

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Example 4: Solve the differential equation

$$\frac{dy}{dx} = e^{-x-y-2}, \text{ where } y(0) = 2$$

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Example 5: Solve the differential equation

$$y^{-2} \frac{dy}{dx} = \frac{e^x}{e^{2x} + 1}, \text{ where } y(0) = 1$$

Separable Differential Equations - Application

Example 6: Suppose that the battery on your phone is draining at a rate that is described by $B(t)$ (t measured in seconds) where

$$\frac{dB}{dt} = -\frac{1}{5}B, \text{ where } B(0) = 100$$