



## Why

We want to model physical phenomena.

## Definition

A *differential equation* is an equation relating functions and their derivatives.

## Basic Example

For example, let  $f : \mathbf{R} \rightarrow \mathbf{R}$  be differentiable everywhere and denote the derivative of  $f$  by  $f' : \mathbf{R} \rightarrow \mathbf{R}$ . Suppose that there exists  $\alpha \in \mathbf{R}$  so that for all  $x \in \mathbf{R}$ ,

$$f'(x) = \alpha f(x).$$

## Solutions

The *solution* of a differential equation is a function (or functions) which satisfy the equation.<sup>1</sup>

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<sup>1</sup>Future editions will expand.



