



# Convex Functions

## 1 Why

We speak of a function which always bends up.

## 2 Definition

A **convex** real-valued function is a function defined on a convex set of real numbers for which the result of the function on a convex combination of any two points in the domain is smaller than the convex combination of the same length of the value of the function on the endpoints.

### 2.1 Notation

Let  $R$  denote the set of real numbers. Let  $A \subset R$  be a convex set. The function  $f : A \rightarrow R$  is convex if, for any  $a, b \in A$  and  $t \in [0, 1]$ ,

$$f(ta + (1 - t)b) \leq tf(a) + (1 - t)f(b).$$