



## Why

We speak of functions which always bends up.<sup>1</sup>

## 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.<sup>2</sup> A function  $f : \mathbf{R} \rightarrow \mathbf{R}$  is *concave* if the function  $-f$  is convex.

## Notation

Let  $A \subset \mathbf{R}$  be a convex set. The function  $f : A \rightarrow \mathbf{R}$  is convex if, for any  $a, b \in A$  and  $t \in [0, 1]$ ,

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

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

<sup>2</sup>Future editions will include figures



