

## **REAL CONVEX FUNCTIONS**

## 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  $f: \mathbf{R} \to \mathbf{R}$  is concave if the function -f is convex.

## Notation

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

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

<sup>&</sup>lt;sup>1</sup>Future editions may expand.

<sup>&</sup>lt;sup>2</sup>Future editions will include figures

