## A method to find the global optimum of a function

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#### Abstract

This is a method to find the global optimum value of a function. It uses a generalization of the min function applied to the values of a function. I provide a method to find the x value of the global optimum.


Keywords: functions, optimization, global, global optimum

## 1. Global optimum value

I used this formula to find the minimum of a list of values (https://math.stackexchange.com/users/232/qiaochuyuan, n.d.).

$$
\begin{equation*}
\min \left(x_{1}, \ldots, x_{n}\right)=\lim _{k \rightarrow-\infty} \sqrt[k]{a_{1}^{k}+\ldots+a_{n}^{k}} \tag{1.1}
\end{equation*}
$$

The extension to the values of a function for its domain from $-\infty, \infty$ is:

$$
\begin{equation*}
\min (f(x))=\lim _{k \rightarrow-\infty}\left(\int_{-\infty}^{\infty} f(x)^{k} d x\right)^{1 / k} \tag{1.2}
\end{equation*}
$$

This formula can find the global optimum value of a function if you can evaluate it symbolically. If you can't, you can also evaluate it numerically to approximate the global optimum value.

## 2. GLOBAL OPTIMUM

The global optimum's $x$ value is at:

$$
\begin{equation*}
\pm \lim _{k \rightarrow \infty} \min ((f(x)-\min (f(x)) * k+|x|) \tag{2.1}
\end{equation*}
$$

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