

Simple function (without mapping) used inside a paragraph  $f : \mathbb{R} \rightarrow \mathbb{R}$  as inline math.

Simple function (with mapping) used inside a paragraph  $f : \mathbb{R} \rightarrow \mathbb{R}$ ,  $x \mapsto f(x)$  as inline math.

Simple function as rendered in display math:

$$\begin{aligned} f : \mathbb{R} &\rightarrow \mathbb{R} \\ x &\mapsto f(x) \end{aligned}$$

Simple function with definition:

$$\begin{aligned} f : \mathbb{R} &\rightarrow \mathbb{R} \\ x &\mapsto f(x) := x^2 \end{aligned}$$

Function with alternative writing:

$$\begin{aligned} \exp : \mathbb{R} &\rightarrow \mathbb{R} \\ x &\mapsto e^x \end{aligned}$$

Function with alternative notation and definition:

$$\begin{aligned} \exp : \mathbb{R} &\rightarrow \mathbb{R} \\ x &\mapsto e^x := \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n \end{aligned}$$

Or forcing display math inside the definition:

$$\begin{aligned} \exp : \mathbb{R} &\rightarrow \mathbb{R} \\ x &\mapsto e^x := \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n \end{aligned}$$

Function with different domain and codomain:

$$\begin{array}{lll} \text{sqrt} : \mathbb{N} \rightarrow \mathbb{R} & \text{sqrt} : \mathbb{N} \rightarrow \mathbb{R} & \text{sqrt} : \mathbb{N} \rightarrow \mathbb{R} \\ n \mapsto \sqrt{n} & n \mapsto \sqrt{n} & n \mapsto \sqrt{n} \end{array}$$

Functions with multiple variables

$$\begin{aligned} f : A \times B &\rightarrow C \\ (a, b) &\mapsto f(a, b) \end{aligned}$$

Unitary operator

$$\begin{aligned} \exp : \mathbb{R} &\rightarrow \mathbb{R} \\ x &\mapsto \exp x := \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n \end{aligned}$$

Binary operator

$$\begin{aligned} + : \mathbb{R} \times \mathbb{R} &\rightarrow \mathbb{R} \\ (x, y) &\mapsto x + y \end{aligned}$$

Using macros in definition:

$$\begin{aligned} \langle \cdot, \cdot \rangle : \mathbb{R}^2 \times \mathbb{R}^2 &\rightarrow \mathbb{R} & \| \cdot \| : \mathbb{R}^2 &\rightarrow \mathbb{R} \\ (x, y) &\mapsto \langle x, y \rangle & x &\mapsto \|x\| := \sqrt{\langle x, x \rangle} \end{aligned}$$

More complex definitions, requiring a third line:

$$\begin{aligned} + : \mathbb{R}^{\mathbb{R}} \times \mathbb{R}^{\mathbb{R}} &\rightarrow \mathbb{R}^{\mathbb{R}} \\ (f, g) &\mapsto f + g \\ \forall x \in \mathbb{R} : (f + g)(x) &= f(x) + g(x) \end{aligned}$$