We take
$\mathbb{N} = \{0, 1, 2, 3, ...\}$ the set of natural numbers obtained by Peano's assioms
$\mathbb{Z} = \{p - q | \forall p, q \in \mathbb{N}\} = \{..., -3, -2, -1, 0, 1, 2, 3, ...\}$ the set of integer numbers
$\mathbb{Q} = \{\frac{r}{s} | r \in \mathbb{Z}, s \in \mathbb{Z} - \{0\}\}$ the set of rational numbers
$\mathbb{R} =$ the set of real numbers constructed by rational numbers throught Dedekind's sections.

A function, f, is a relation between two sets where to each member of first set is linked at most one member of second set.
A real succession $(a_n)_{n \in \mathbb{N}}$ is a function from $\mathbb{N}$ to $\mathbb{R}$ defined by $n \mapsto a_n$. The most simply succession is $(n)_{n \in \mathbb{N}}$ this succession is divergent.
Let $(a_n)_{n \in \mathbb{N}}$ a real succession is say a serie the sum $\sum_{n \in \mathbb{N}} a_n = a_0 + a_1 + a_2 + ...$

The natural set can be sayed like the successions of partial sum of the sum 0+1+1+1+1+... in fact $s_0 = 0$, $s_1 = 0{+}1 = 1$, $s_2 = 0{+}1{+}1 = 2$,... so a serie $\sum_{n \in \mathbb{N}} a_n \geqslant 0{+}1{+}1{+}1{+}1{+}...$ is a divergent serie because not exist a real number grater than a real succession $(n)_{n \in \mathbb{N}}$ so not exist a real grater than the succession of the partial sum of the serie. Conversely, if $\sum_{n \in \mathbb{N}} a_n \leqslant 0{+}1{+}1{+}1{+}1{+}1{+}...$ the real exists for the construction of real numbers, in general this real depends by infinity.
For example the armonic serie $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + ...$ have for domain the set of natural numbers for codomain the real set that contained the natural set obtained from the sum 0+1+1+1+1+... so the harmonic serie is minor than 0+1+1+1+1+... so a real number in codomain grater than succession of the partial sum of harmonic serie exists. In general the serie $\sum_{n \in \mathbb{N}} \frac{1}{n^s}$ converges for s>0.

The same discuss is true for the functions in fact if get a function from reals to reals, for example if we get the esponential function we note that it diverges more fast of the function that a real x maps the real x so exist a real a such that the limit of exp(x) for x tends to a is infinity and for the inverse of exp(x) is true the opposite that is it changes the domain with codomain.