Graphs and Transformations

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What is a function?

$$f : A \to B$$
$$x \mapsto f(x)$$

Where A is the domain (set of the possible inputs to the function), B is the range or co-domain (set of possible outputs from the function) and $x \mapsto f(x)$ is the mapping rule or operation.
The domain can be smaller than it needs to be and likewise the co-domain can be larger than it needs to be.

Example 1:

$$\begin{aligned} f : \mathbb{R} &\to \mathbb{R} \\ x &\mapsto x^2 \end{aligned}$$

$$\begin{aligned} g : \mathbb{Z} &\to \mathbb{Z}^+ \\ x &\mapsto x^2 \end{aligned}$$

$$\begin{aligned} h : \mathbb{R}\backslash\{0\} &\to \mathbb{R} \\ x &\mapsto \frac{1}{x} \end{aligned}$$

$$\begin{aligned} k : D &\to \mathbb{R} \\ x &\mapsto 4x^2 + 12x + 73 \end{aligned}$$

$$\begin{aligned} D = \{x \in \mathbb{R} \mid \mod x, 2 = 0\} l : [0, \infty) &\to \mathbb{R} \\ x &\mapsto \sqrt{x} \end{aligned}$$