

$$\text{Let } f : \begin{cases} \mathbb{R} \rightarrow \mathbb{R} \\ x \mapsto \sin x \end{cases}$$

$f^{-1}(0)$  : doesn't exist because:  $\exists y \in \mathbb{R} \mid \nexists! x \in \mathbb{R}, f(x) = y$ , like  $f(\pi) = f(0) = 0$

$$f^{-1}(\{0\}) = \{2k\pi, \forall k \in \mathbb{Z}\}$$

$$f^{-1}([0, +\infty[) =$$

$$f^{-1}([0, \pi]) =$$

$$f(\{0\}) = \{0\}$$

$$f(\mathbb{R}) = [0, 1]$$