Check the details of example 3.

$p : \mathbb{R} \to \{a, b, c\}$, by $p(x) = \begin{cases} a, & x > 0 \\ b, & x < 0 \\ c, & x = 0 \end{cases}$

$p^{-1}(a) = (0, \infty)$, $p^{-1}(b) = (-\infty, 0)$

$p^{-1}(c) = \{0\}$, $p^{-1}(\{a, b\}) = (-\infty, 0) \cup (0, \infty)$

$p^{-1}(\{a, c\}) = [0, \infty)$, $p^{-1}(\{b, c\}) = (-\infty, 0]$

So we get the quotient topology on $\{a, b, c\}$