Problem 1:

Let $a \in [0, 1]$.

Consider that if $0 < x \leq a \leq 1$, then there's a $y \in [0, 1]$ such that $x^y = a$: Take $y = \frac{\ln(a)}{\ln(x)}$ if $x \neq 1$, and $y = 0$ is $x = 1$.

Problem 2: