First, notice that it is enough to show the result for f (since f^{-1} will also be strictly monotonic and onto; also, it is clear that f will be injective, which proves the existence of f^{-1}). We can assume f is strictly increasing.

Now assume f has got a discontinuity at point $x \in U$. There is some $\epsilon > 0$ such that for every $\eta > 0$, you can find y with $0 < y - x < \eta$ and $f(y) - f(x) > \epsilon$, or equivalently $f(y) > \epsilon + f(x)$. Since f is strictly increasing, this implies that this inequality holds for every $y > x$, meaning f will never take any value in $]f(x), f(x) + \epsilon[$, and hence cannot be onto. Absurd.