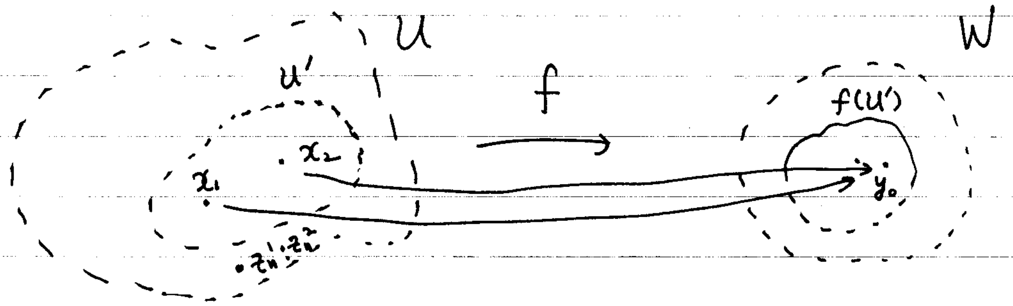
finite. The first of these is by definition. The second means that open sets map onto open sets, which is clear, as is the third property.

Γ $f: U \rightarrow W$. open $U' \subset U$.
$y_0 \in f(U') \subset W \Rightarrow f^{-1}(y_0) = \{x_1, x_2, \cdots x_d\}$.



Suppose we can not find an open set containing y_0 which is contained in $f(U')$. $\Rightarrow \exists$, for each n, y_n s.t
$f(U') \not\ni y_n$ $\|y_0 - y_n\| < \frac{1}{n}$. $f^{-1}(y_n) = \{z_n^1, z_n^2\} \subset U$.
$\Rightarrow \exists$ a limit point z^0 in $U - U'$. $\Rightarrow f(z^0) = y_0$.
$\Rightarrow f(x_1) = f(x_2) = f(z^0) = y_0 \Rightarrow$ Contradiction to the fact that $\# f^{-1}(y_0) = 2$. Here we assumed $d = 2$.
Since $f^{-1}(\overline{W})$ compact and $f^{-1}(W)$ open in an open ball, we may assume that $\exists$ a limit point z^0 in $U - U'$.
If necessary, we may choose $W' \subset \overline{W'} \subset W$. $f(\overline{W'})$ compact, for $f(\overline{W'})$ in the original U, and $\overline{f(\overline{W'})} \cap \partial U = \phi$. $\Rightarrow f$ is proper. ⌟

These finite mappings have quite differently from, for example, blowing-down mappings such as