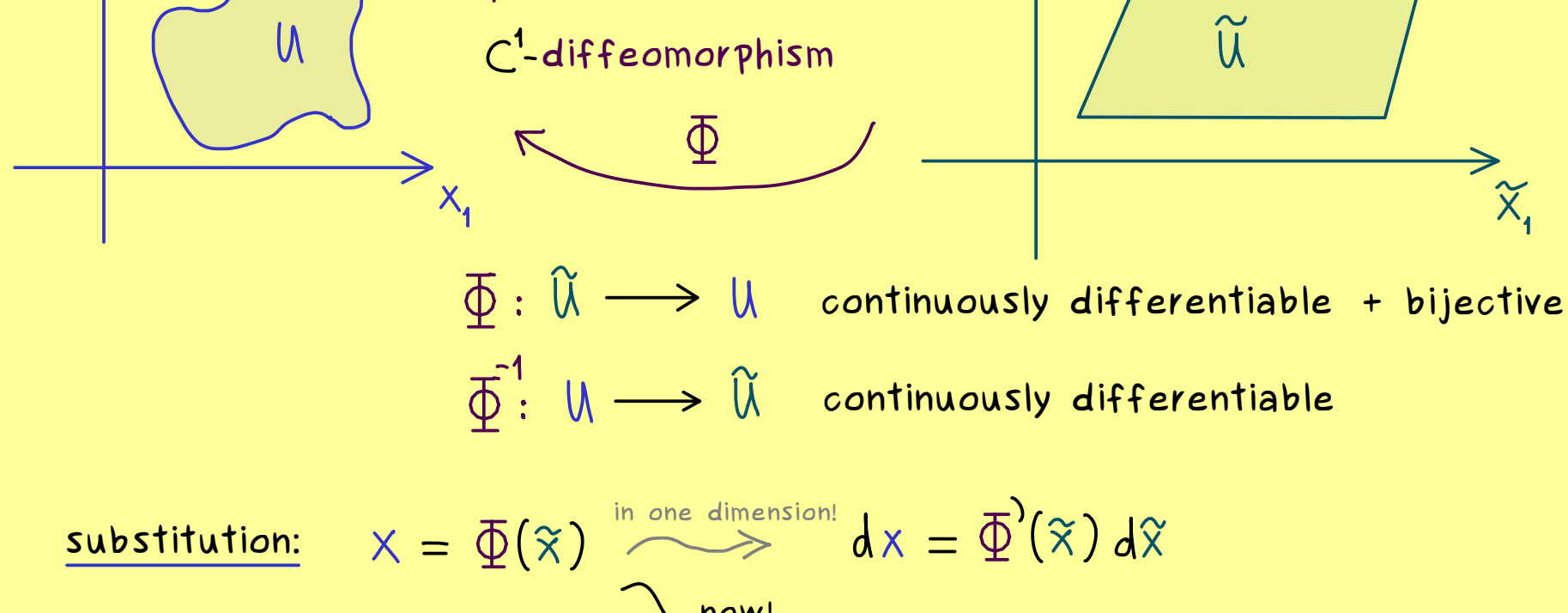


Multidimensional Integration - Part 5

$$f: U \rightarrow \mathbb{R} \text{ measurable, } U \subseteq \mathbb{R}^n \text{ open}$$

$$\int_U f(x) d^n x$$



substitution: $x = \Phi(\tilde{x}) \xrightarrow{\text{in one dimension!}} dx = \Phi'(\tilde{x}) d\tilde{x}$
 $\xrightarrow{\text{now!}} d^n x = |\det(J_\Phi(\tilde{x}))| d^n \tilde{x}$

Change of variables formula: $\int_{\Phi[\tilde{U}]} f(x) d^n x = \int_{\tilde{U}} f(\Phi(\tilde{x})) |\det(J_\Phi(\tilde{x}))| d^n \tilde{x}$

If one exists, then also the other!