Chapter 4, Section 4. Exercises 1, 2, and 4.

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Differential Geometry Independent Study

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Exercise 4.4.4

Let $f : S_1 \to S_2$ be a local diffeomorphism and let γ be a regular curve on S_1. Show that $f \circ \gamma$ is a regular curve on S_2.

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f maps a surface $S_1 \in \mathbb{R}^3$ to another surface $S_2 \in \mathbb{R}^3$. $f \circ \gamma$ can also be written as

$$f(\gamma) = S_2.$$

More explicitly, a local diffeomorphism will map all $p \in S_1$ to some $\tilde{p} \in S_2$.

Knowing that all $p \in \gamma$ will also be in S_1, γ will always be mapped to $\tilde{\gamma} \in S_2$ inadvertently via f, so long as it is regular in S_1 (as in, never breaking).