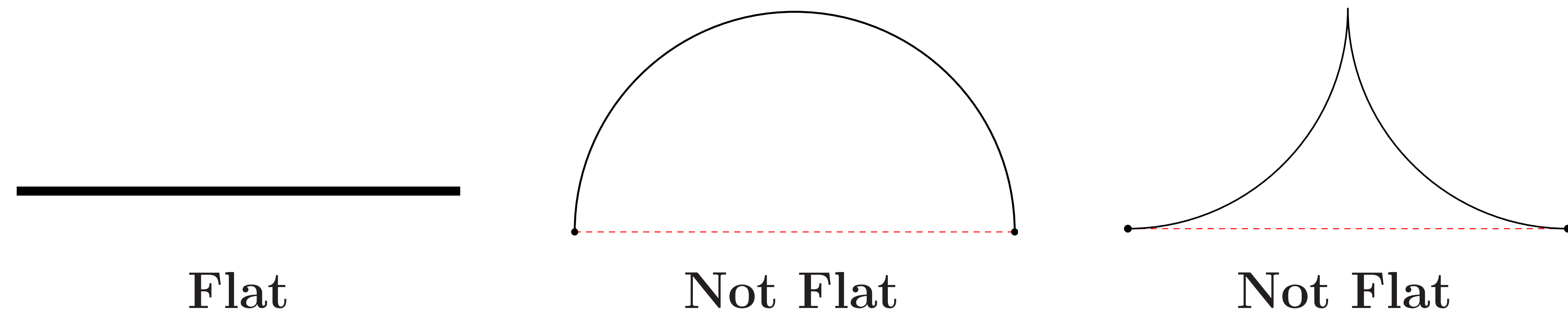# Curvature, Roughly

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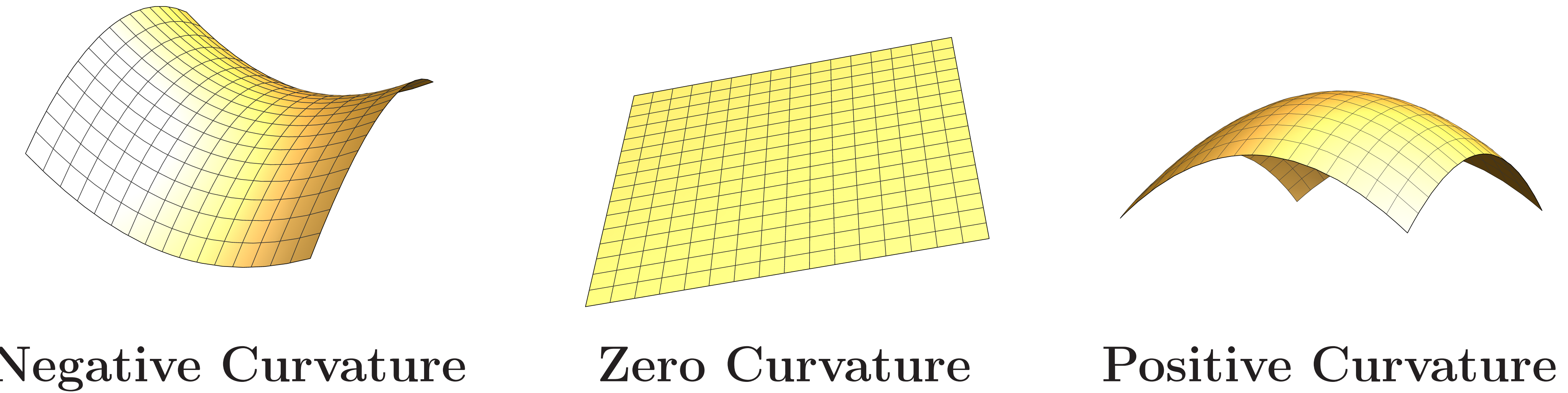
What Is Curvature?

Roughly speaking, curvature is a mathematical device which quantifies how "not flat" something is:
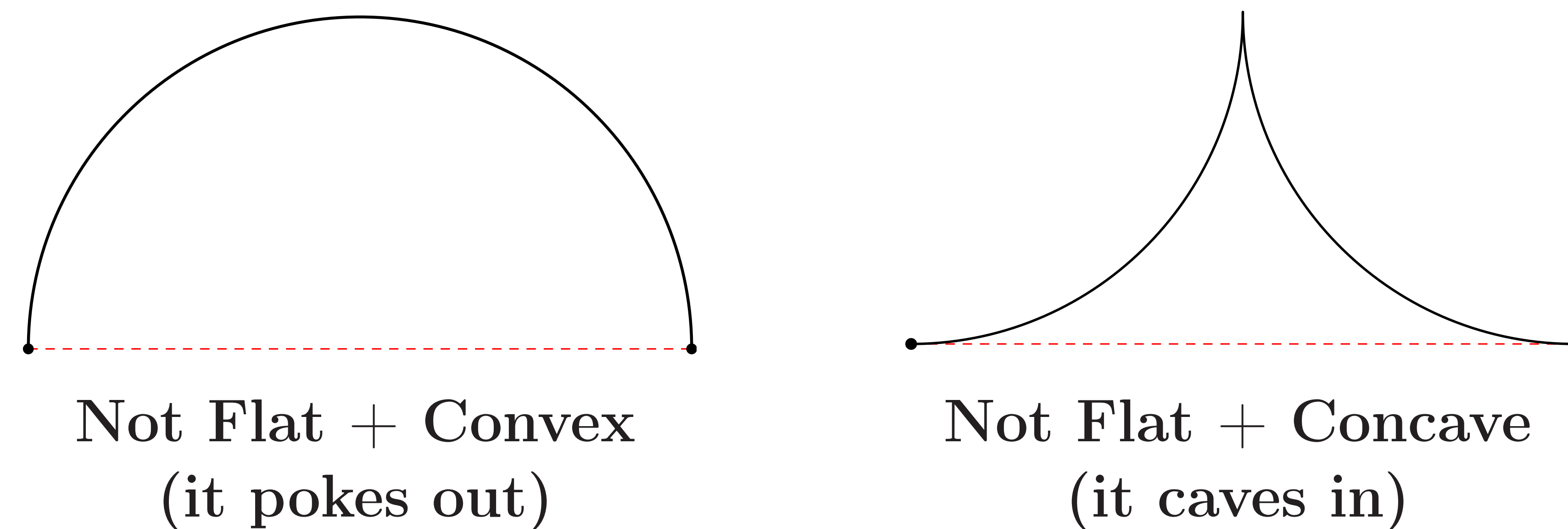
Flat   **Not Flat**   **Not Flat**

Quantifying Curvature

In particular, there are different kinds of "not flat":

Not Flat + Convex
(it pokes out)

**Not Flat + Concave**
(it caves in)

This can be made mathematically precise:

Roughly speaking, flat things are said to have *zero curvature* while things which are not-flat and convex are *positively curved* and those which are non-flat and concave are *negatively curved*:

Positively Curved   **Negatively Curved**

Generalizations

These ideas generalize to higher dimensions as well:

Negative Curvature   **Zero Curvature**   **Positive Curvature**
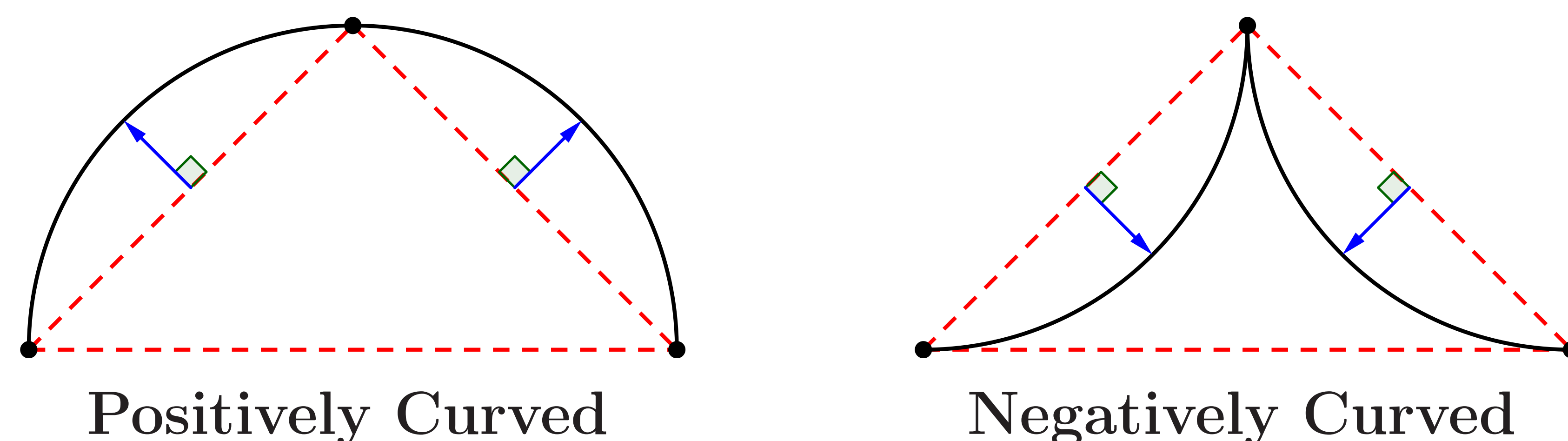
Example: The Torus

Higher dimensions are more difficult because objects are often visualized in a distorted manner. For example, the torus (a hollowed-out donut):

Is it convex?   **Is it concave?**   **No; it's flat.**
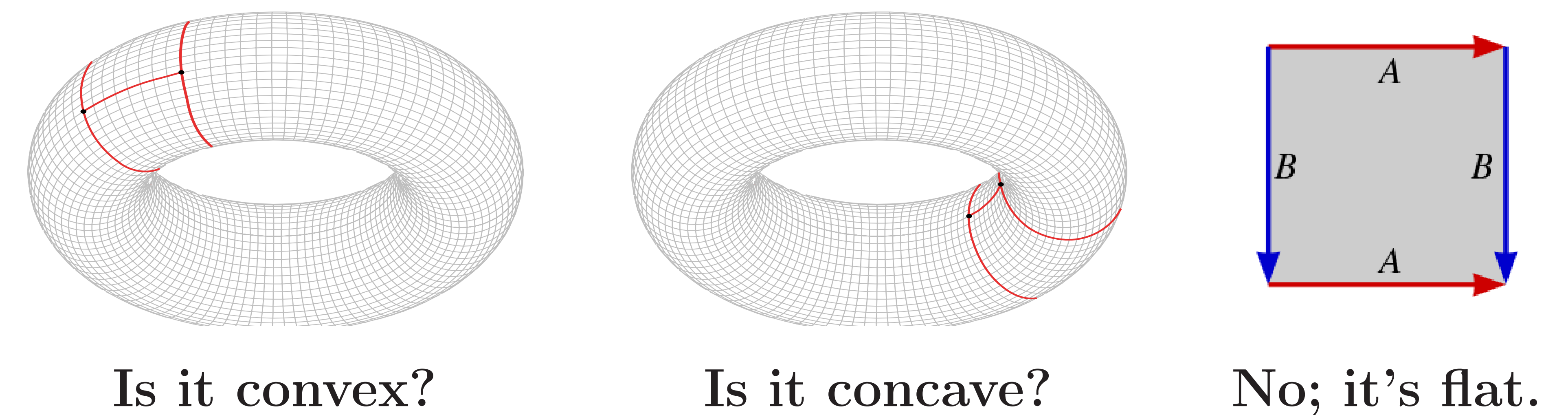
Why Do We Care?

Because: Curvature is *everywhere* and is still widely-studied!

Negative   **Positive**   **Nobody Knows!**
(The Universe)