

# **Curvature in Mathematics and Physics (Dover Books on Mathematics)**

Shlomo Sternberg



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#### Curvature in Mathematics and Physics (Dover Books on Mathematics) Shlomo Sternberg

This original text for courses in differential geometry is geared toward advanced undergraduate and graduate majors in math and physics. Based on an advanced class taught by a world-renowned mathematician for more than fifty years, the treatment introduces semi-Riemannian geometry and its principal physical application, Einstein's theory of general relativity, using the Cartan exterior calculus as a principal tool. Starting with an introduction to the various curvatures associated to a hypersurface embedded in Euclidean space, the text advances to a brief review of the differential and integral calculus on manifolds. A discussion of the fundamental notions of linear connections and their curvatures follows, along with considerations of Levi-Civita's theorem, bi-invariant metrics on a Lie group, Cartan calculations, Gauss's lemma, and variational formulas. Additional topics include the Hopf-Rinow, Myer's, and Frobenius theorems; special and general relativity; connections on principal and associated bundles; the star operator; superconnections; semi-Riemannian submersions; and Petrov types. Prerequisites include linear algebra and advanced calculus, preferably in the language of differential forms.



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