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★Lectures on differential geometry.

Translated from the 2006 Russian edition by Gleb V. Dyatlov.

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The world does not suffer from a paucity of books on elementary differential geometry (a query at amazon.com yields 676 results). Some are quite beautiful and some, perhaps, not so. Presumably, a new addition to the supply should present something genuinely new, either in content, presentation, or perspective. The set of lecture notes under review is quite brief and does not deviate significantly from the standard menu of topics. The first two chapters contain a leisurely and nicely written introduction to the theory of curves and surfaces. Chapters 3 and 4 are not so leisurely, beginning with the definition of a topological space and moving briskly through manifolds, tensors, Riemannian metrics, connections, curvature and geodesics. Here the proofs tend to seem more like sketches, but they are honest and illuminating sketches. Chapter 5 is a nice introduction to the Lobachevskii plane and Minkowski space with a few indications of the relevance of the latter to special relativity. The remaining chapters are a bit more specialized, covering minimal surfaces, Lie groups, representation theory and Poisson and symplectic geometry. Here many details are, of necessity, omitted entirely, but the author always makes an effort to at least suggest what is lurking in the background. For example, there is a careful, elementary discussion of the representation theory for finite groups which can then be used to suggest what must be done to obtain analogous results for compact Lie groups. The physical origins and applications of the geometry are also given their due at regular intervals. Indeed, these lecture notes might appeal most to those students of physics looking for an accurate, but uncluttered introduction to the underlying ideas of modern differential geometry and how they might be of use; or, perhaps, the student of mathematics who would like a glimpse of the forest while immersed among the trees of a more traditional text. If there is something new here then it is a combination of brevity, accuracy and readability with more than a perfunctory nod toward physics.

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