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Schrodinger eigenstates for surface-confinement problems MORTEN WILLATZEN, JENS GRAVESEN, University of Southern Denmark, Grundtvigs Alle 150, DK-6400 Sonderborg, Denmark, LOK C. LEW YAN VOON, Department of Physics, Wright State University, USA — The theory of a quantum-mechanical particle confined to a surface is described using differential geometry arguments including the simplification of the three-dimensional Schrödinger problem into three ordinary differential equations in curved coordinates for the case of an arbitrary surface of revolution. These equations are solved - in terms of eigenvalues and eigenstates - either completely analytically or by use of a simple one-dimensional finite-difference scheme for the cases of a cylinder, a cone, an elliptic torus, a sinusoidal-shaped surface of revolution, and a catenoid. A comparison with an exact three-dimensional treatment of the hollow cylinder problem shows that the surface-confinement approximation (corresponding to assuming zero thickness of the particle domain perpendicular to the surface) is excellent in cases where the (hollow) cylinder thickness is less than approximately 10% of the cylinder radius, hence justifying the rationale in employing a similar analysis for the other (abovementioned) more complicated surface-confinement problems. Symmetry properties of the various eigenstates are finally discussed and compared.

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