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Exact closed-form solutions of the Dirac equation with a scalar exponential potential.

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Summary: The problem of a fermion subject to a general scalar potential in a two-dimensional world for nonzero eigenenergies is mapped into a Sturm-Liouville problem for the upper component of the Dirac spinor. In the specific circumstance of an exponential potential, we have an effective Morse potential which reveals itself as an essentially relativistic problem. Exact bound solutions are found in closed form for this problem. The behaviour of the upper and lower components of the Dirac spinor is discussed in detail, particularly the existence of zero modes.

MSC:

81Q05 Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other equations of quantum mechanics

Cited in 4 Documents

Full Text: [DOI](#) [arXiv](#)

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