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The Riemann-Roch theorem and zero-energy solutions of the Dirac equation on the Riemann sphere. (English) [Zbl 1206.14060] J. Geom. Phys. 61, No. 1, 172-179 (2011).

Summary: We revisit the connection between the Riemann-Roch theorem and the zero-energy solutions of the two-dimensional Dirac equation in the presence of a delta-function-like magnetic field. Our main result is the resolution of a paradox—the fact that the Riemann-Roch theorem correctly predicts the number of zero-energy solutions of the Dirac equation despite counting what seem to be functions of the wrong type.

MSC:
14H81 Relationships between algebraic curves and physics
14C40 Riemann-Roch theorems

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Riemann-Roch theorem; the two-dimensional Dirac equation in a magnetic field; zero modes; Riemann surfaces

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