

Abstract Submitted
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Closed Analytic Solution for the Potential and Equations of Motion in the Presence of a Gravitating Oblate Spheroid¹ WILLIAM ATKINSON, The Boeing Company — A closed analytic solution for the potential due to a gravitating solid oblate spheroid, derived in oblate spheroidal coordinates in this paper, is shown to be much simpler than those obtained either in cylindrical coordinates (MacMillan) or in spherical coordinates (McCullough). The derivation in oblate spheroidal coordinates is also much simpler to follow than those of the MacMillan or McCullough. The potential solution is applied in exacting a closed solution for the equations of motion for an object rolling on the surface of the spheroid subjected only to the gravitational force component tangential to the surface of the spheroid. The exact solution was made possible by the fact that the force can be represented as separable functions of the coordinates only in oblate spheroidal coordinates. The derivation is a good demonstration of the use of curvilinear coordinates to problems in classical mechanics, potential theory, and mathematical physics for both undergraduate and graduate students.

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