

Vector Calculus Approach to Closed Geodesic of the Torus

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We derive the geodesic equations for arbitrary surfaces of revolution in R^3 by applying basic vector calculus to our intuitive understanding of a geodesic. We then apply these equations to the standard torus which reveal that any geodesic falls into exactly one of five classes based upon a single parameter. We then determine which geodesics eventually loop back onto themselves through examining the two periods of oscillation of the curve. We finish with concrete and illuminating examples of closed geodesics.