

Abstract Submitted
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Elliptical-like orbits on a warped spandex fabric: A theoretical/experimental undergraduate research project CHAD MIDDLETON, DANNYL WELLER, Colorado Mesa University — We present a theoretical and experimental analysis of the elliptical-like orbits of a marble rolling on a warped spandex fabric. We arrive at an expression describing the angular separation between successive apocenters, or equivalently successive pericenters, in both the small and large slope regimes. We find that a minimal angular separation of 197 degrees is predicted for orbits with small radial distances when the surface is void of a central mass. We then show that for small radii and large central masses, when the orbiting marble is deep within the well, the angular separation between successive apocenters transitions to values greater than 360 degrees. We lastly compare these expressions to those describing elliptical-like orbits about a static, spherically symmetric massive object in the presence of a constant vacuum energy, as described by general relativity.

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