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Newtonian and general relativistic orbits with small eccentricities on 2D surfaces CHAD MIDDLETON, Colorado Mesa University — As has previously been shown, there exists no two-dimensional (2D) cylindrically-symmetric surface residing in a uniform gravitational field that can generate the precise Newtonian-like orbits of planetary motion, except in the special case of circular orbits. Here we explore nearly circular orbits with small eccentricities on 2D surfaces. By employing a perturbative method to first-order in the eccentricity, we generate the differential equation that relates the slope of a given 2D surface to the precession parameter of the orbit. By demanding that the surface generates the stationary elliptical orbits of Newtonian gravitation with small eccentricities, we obtain the solution for the slope of this surface. We then repeat the process for general relativistic orbits about non-rotating, spherically-symmetric massive objects. By now demanding that the surface generates the precessing elliptical orbits of general relativity with small eccentricities, we find the slope of this surface and then compare it to its Newtonian counterpart.

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