1: Constants

The masses of mercury and the sun, and the period of mercury, were obtained from an atlas [1] [1]. The universal gravitational constant and the eccentricity of mercury's orbit were obtained from [2], pages 260 and 309. All the values are expressed in cgs units, and the letters 'cgs' were added to the variable names to allow for the same symbols to be used for the dimensionless versions of these quantities.

2: Units

To avoid using very large numbers, new units were chosen for length, mass, and time. The values are respectively the mean radius of mercury's orbit [1], mercury's mass, and the period of mercury's orbit.

3: Dimensionless Constants

Using the new units, dimensionless versions of the constants are defined. All subsequent calculations will be dimensionless.

4: Energy and Angular Momentum, Points on the Orbit, & Motion in Time

The usual initial conditions in Newton's mechanics are position and velocity. However, as pointed out in [3] page ---, these are meaningless in quantum mechanics, and it is therefore desirable to use energy and angular momentum as input variables. Once, E and l are computed, the eccentricity is computed in terms of E, l, k, and m.

All of the equations in these three sections come out of the standard solution to the central force problem in classical mechanics. See [3] pages ---. This study occupied me for about two months.

5: The Orbit as a Geodesic in a Riemannian 3-space

Consider a three dimensional space which is covered by the variables $x^i \leftrightarrow r\theta\varphi$, where i takes the values 0, 1, 2, and where the superscripted x's stand respectively for r, θ, and φ. Let the infinitesimal element of arc length in this space be defined by

Eq 1: $$dS^2 = 2m(E-V)g_{ij}dx^i dx^j,$$

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[1] References to the bibliography are enclosed in square brackets.