Now use equations Eq 13 through Eq 15, along with the last part of Eq 8, to define the three functions f_3, f_4, and f_5. Including only the non-zero Christoffel symbols gives the following three equations:

Eq 26:
$$f_3 = -\left\{ \begin{matrix} 0 \\ 00 \end{matrix} \right\} (y_3)^2 - \left\{ \begin{matrix} 0 \\ 11 \end{matrix} \right\} (y_4)^2 - \left\{ \begin{matrix} 0 \\ 22 \end{matrix} \right\} (y_5)^2$$

Eq 27:
$$f_4 = -2\left\{ \begin{matrix} 1 \\ 01 \end{matrix} \right\} y_3 y_4 - \left\{ \begin{matrix} 1 \\ 22 \end{matrix} \right\} (y_5)^2$$

Eq 28:
$$f_5 = -2\left\{ \begin{matrix} 2 \\ 02 \end{matrix} \right\} y_3 y_5 - 2\left\{ \begin{matrix} 2 \\ 12 \end{matrix} \right\} y_4 y_5$$

The initial conditions are shown in Eq 29. The initial value for r is the perihelion radius, r_p. At perihelion, the time rate of change of r, $\dot{r}_0 \equiv \left[\frac{dr}{dt} \right]_{t=0}$, is zero. For motion in the xy-plane (see the discussion following Eq 4), the inital values of θ and its time derivative will be $\pi/2$, and zero respectively. The value of zero for the initial φ corresponds to an initail position on the x-axis. The value given for φ, $\dot{\varphi}_0 \equiv \left[\frac{d\varphi}{dt} \right]_{t=0}$, follows from Eq 3.

Eq 29:
$$\begin{bmatrix} r_0 \\ \theta_0 \\ \varphi_0 \\ \dot{r}_0 \\ \dot{\theta}_0 \\ \dot{\varphi}_0 \end{bmatrix} = \begin{bmatrix} r_p \\ \pi/2 \\ 0 \\ 0 \\ 0 \\ l/mr_p^2 \end{bmatrix}$$

The time derivatives in Eq 29 must now be converted into derivatives with respect to the arc length parameter, S, in the Riemannian 3-space. Begin with the expression for arc length, s, in Euclidean three space, and solve for the speed, v, as shown in Eq 30. This is the speed of the planet mercury, which is being treated as a point mass.