Eq 61 leads to

Eq 62: $$(y_7)_0 = \left(\frac{dy_4}{ds}\right)_0 = \left(\frac{dx^4}{ds}\right)_0 = \left(\frac{dt}{ds}\right)_0 = \left[c^2\gamma_p - \left(\frac{l}{mr_p}\right)^2\right]^{-\frac{1}{2}}$$

where γ_p is γ evaluated for r equal to the perihelian distance, r_p. Next, it follows from the chain rule for differentiation, $\frac{dx^i}{ds} = \frac{dx^i}{dt}\frac{dt}{ds}$, that $\left(\frac{dr}{ds}\right)_0 = 0$ and $\left(\frac{d\theta}{ds}\right)_0 = 0$. Then from

Eq 63: $$1 = -\gamma^{-1}\left(\frac{dr}{ds}\right)^2 - r^2\left(\frac{d\theta}{ds}\right)^2 - r^2\sin^2\theta\left(\frac{d\varphi}{ds}\right)^2 + c^2\gamma\left(\frac{dt}{ds}\right)^2$$

there follows

Eq 64: $$(y_6)_0 = \left(\frac{dy_2}{ds}\right)_0 = \left(\frac{dx^2}{ds}\right)_0 = \left(\frac{d\varphi}{ds}\right)_0 = \frac{1}{r_p}\left\{\left[1 - \frac{1}{\gamma_p}\left(\frac{l}{mcr_p}\right)^2\right]^{-1} - 1\right\}^{-\frac{1}{2}}$$

Finally, *ds* is estimated for the numerical solution of the system of eight first order differential equations by using Eq 62:

Eq 65: $$ds = \left[\left(\frac{dt}{ds}\right)_0\right]^{-1} dt = \left[\left(\frac{dt}{ds}\right)_0\right]^{-1} \frac{P}{NR4} = \frac{P}{NR4(y_7)_0}$$

where P is the Newtonian period and *NR4* is the number of steps desired in the solution. As in the problem treated in appendix I, the number of steps was determined by trial and error to get the desired plots.

This concludes the presentation of mathematics for the Mathcad worksheet with the title *Mercury & Suns: Einstein.*