where β and γ are integration constants.

Now put (A12) into (A10) to get

$$\dot{\psi} + 2(\omega/R)\left[\frac{2R\alpha}{\omega} + \beta\cos(\omega t + \gamma)\right] = \alpha, \quad \text{or}$$

$$\dot{\psi} = -3\alpha - \frac{2\omega\beta}{R}\cos(\omega t + \gamma). \qquad (A13)$$

Integrating (A13) gives

$$\boxed{\psi = -3\alpha t - \frac{2\beta}{R}\sin(\omega t + \gamma) + \delta} \qquad (A14)$$

where δ is an integration constant.

Suppose the lens cap is thrown out in the direction of the orbit at $t = 0$.

Then at $t = 0$ we have

$$\psi = 0, \quad \dot{\psi} = \text{const} > 0$$

$$\rho = 0, \quad \dot{\rho} = 0.$$