



$$\tan\left(\frac{\phi}{2}\right) = \sqrt{\frac{1+e}{1-e}} \tan\left(\frac{u}{2}\right)$$

$$u - e \sin u = \omega t \quad \text{where: } \omega = \sqrt{\frac{\alpha}{ma^3}}$$

$$r = a(1 - e \cos(u))$$

$$v_0 = \sqrt{\frac{\alpha}{ma(1 - e^2)}}$$

$$r = \frac{a(1 - e^2)}{(1 + e \cos \phi)}$$

$$E = -\frac{\alpha}{2a}$$

$$L = \sqrt{\alpha ma(1 - e^2)}$$

