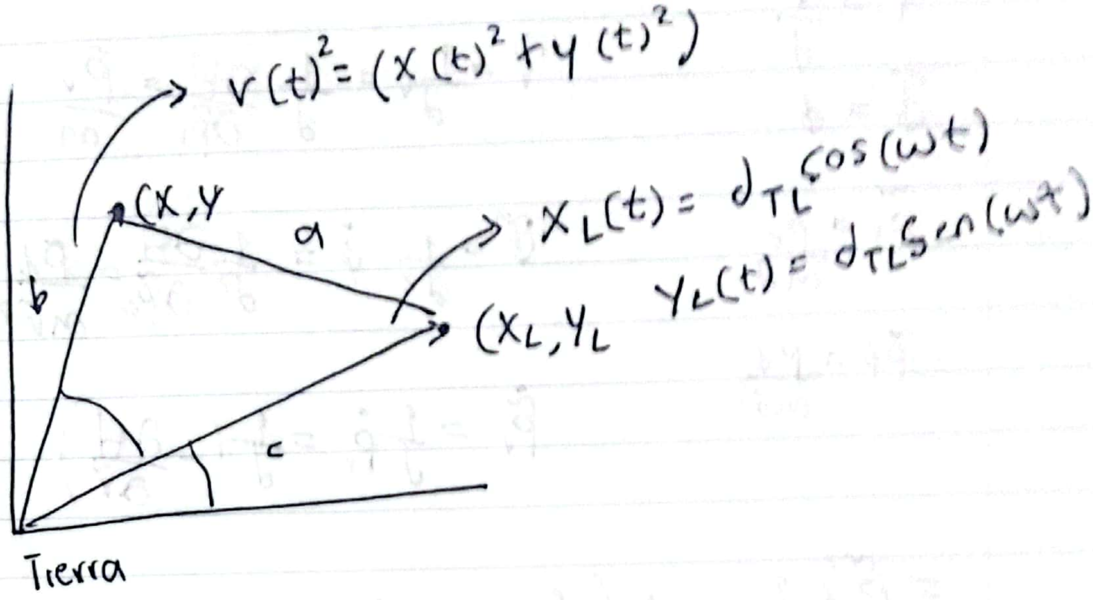

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$r_L = \sqrt{r(t)^2 + d^2 - 2r(t)\,d\,\cos(\phi - \omega t)}$$

$$T = \frac{1}{2} m\left(\dot r^2 + r^2 \dot\phi^2\right), \quad V = -\frac{GmM_T}{r} - \frac{GmM_L}{r_L(r,\phi,t)}$$

$$H = T + V \qquad p_r = \frac{\partial L}{\partial \dot r} = m\dot r, \quad p_\phi = \frac{\partial L}{\partial \dot\phi} = mr^2\dot\phi$$

$$H = \frac{p_r^2}{2m} + \frac{p_\phi^2}{2mr^2} - \frac{GmM_T}{r} - \frac{GmM_L}{r_L(r,\phi,t)}$$

$$\dot r = \frac{\partial H}{\partial p_r} = \frac{p_r}{m} \qquad \dot p_r = -\frac{\partial H}{\partial r} = \frac{p_\phi^2}{mr^3} - \frac{GmM_T}{r^2} - \frac{GmM_L}{r_L^3} * \left(r - d_{TL}\cos(\phi - \omega t)\right)$$

$$\dot\phi = \frac{\partial H}{\partial p_\phi} = \frac{p_\phi}{mr^2} \qquad \dot p_\phi = -\frac{\partial H}{\partial \phi} = -\frac{GmM_L}{r_L^3}\, r\, d_{TL} \operatorname{sen}(\phi - \omega t)$$

$$\tilde{r} = \frac{r}{d}$$

$$\tilde{\phi} = \phi$$

$$\tilde{p}_r = \frac{p_r}{md}$$

$$\tilde{p}_\phi = \frac{p_\phi}{md^2}$$

$$\dot{\tilde{r}} = \frac{1}{d}\dot{r} = \frac{1}{d}\frac{\partial H}{\partial \tilde{p}_r} = \frac{\tilde{p}_r}{m}$$

$$\dot{\tilde{\phi}} = \frac{1}{d^2}\dot{\phi} = \frac{1}{d^2}\frac{\partial H}{\partial \tilde{p}_\phi} = \frac{p_\phi}{m\tilde{r}^2}$$

$$\dot{\tilde{p}}_r = \frac{1}{d}\dot{p}_r = \frac{1}{d}\left(-\frac{\partial H}{\partial \tilde{r}}\right)$$

$$= \tilde{p}_\phi^2 \frac{1}{\tilde{r}^3} - \Delta\left(\frac{1}{\tilde{r}^2} + \mu \frac{1}{\tilde{r}'^3}\left(\tilde{r} - \cos(\phi - \omega t)\right)\right)$$

$$\dot{\tilde{p}}_\phi = \frac{1}{d^2}\dot{p}_\phi = \frac{1}{d^2}\left(-\frac{\partial H}{\partial \tilde{\phi}}\right) = -\Delta\mu \frac{\tilde{r}}{\tilde{r}'^3}\,\mathrm{sen}(\phi - \omega t)$$

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