a) $\bar{r}_1 = 0\bar{\imath} + \bar{\jmath}$ $\qquad \bar{V} = \frac{1}{M_T}\sum m_i \bar{v}_i = \frac{m_2 \cdot \bar{v}_2}{m_1+m_2} = \boxed{\frac{m_2}{m_1+m_2} v\bar{\imath} = \bar{V}}$

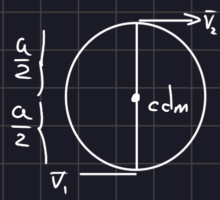
$\bar{v}_2 = v\bar{\imath}$

$\bar{r}_2 = vt\bar{\imath} + a\bar{\jmath}$ $\qquad \bar{R} = \frac{1}{M_T}\sum m_i \bar{r}_i = \frac{m_2 \cdot \bar{r}_2}{m_1+m_2} = \boxed{\frac{m_2}{m_1+m_2} vt\bar{\imath} + \frac{m_2}{m_1+m_2} a\bar{\jmath} = \bar{R}}$

b) $\bar{J}_0 = \cancel{\bar{r}_1 \times \bar{p}_1}^{\,0} + \bar{r}_2 \times \bar{p}_2 = \begin{vmatrix} \bar{\imath} & \bar{\jmath} & \bar{k} \\ vt & a & 0 \\ m_2 v & 0 & 0 \end{vmatrix} = \boxed{-m_2 v a \bar{k} = \bar{J}_0}$

c) Para $t=0$, $\omega r = v$, $\omega = \frac{v}{R} = \frac{\frac{m_2}{m_1+m_2} v}{\frac{m_2}{m_1+m_2} a} = \frac{v}{a}$ $\qquad \omega = \frac{v}{a}$ en módulo, como va en el eje $\bar{k}$, $\boxed{\omega = -\frac{v}{a}}$

d) $\bar{r}_0 = \bar{R} + \bar{r}^*$, $\bar{R} = \frac{m_2}{m_1+m_2} vt\bar{\imath} + \frac{m_2}{m_1+m_2} a\bar{\jmath}$



Al ser un movimiento circular, si lo miras desde el cdm,

$\bar{r}_1^*(t) = \frac{-a}{2} K\left(\sin\left(\frac{v}{a}t\right)\bar{\imath} + \cos\left(\frac{v}{a}t\right)\bar{\jmath}\right)$ $\qquad \bar{v}_1^*(t) = \frac{-Kv}{2}\left(\cos\left(\frac{v}{a}t\right)\bar{\imath} - \sin\left(\frac{v}{a}t\right)\bar{\jmath}\right)$

$\bar{r}_2^*(t) = \frac{a}{2}\hat{K}\left(\sin\left(\frac{v}{a}t\right)\bar{\imath} + \cos\left(\frac{v}{a}t\right)\bar{\jmath}\right)$ $\qquad \bar{v}_2^*(t) = \frac{\hat{K}v}{2}\left(\cos\left(\frac{v}{a}t\right)\bar{\imath} - \sin\left(\frac{v}{a}t\right)\bar{\jmath}\right)$

Al conservarse $\bar{J}^*$: 1. $\sum m_i \bar{r}_i^* = 0$ y 2. $\bar{J}^* = \frac{-m_1 m_2}{m_1+m_2} v a \bar{k}$

1. $(-Km_1 + \hat{K}m_2)\left(\frac{a}{2}\sin\left(\frac{v}{a}t\right)\bar{\imath} + \cos\left(\frac{v}{a}t\right)\bar{\jmath}\right) = 0 \iff -Km_1 + \hat{K}m_2 = 0 \iff \underbrace{Km_1 = \hat{K}m_2}_{3.}$

2. $\frac{m_1 a K^2 v}{4}\begin{vmatrix} \bar{\imath} & \bar{\jmath} & \bar{k} \\ \sin\left(\frac{v}{a}t\right) & \cos\left(\frac{v}{a}t\right) & 0 \\ \cos\left(\frac{v}{a}t\right) & -\sin\left(\frac{v}{a}t\right) & 0 \end{vmatrix} + \frac{m_2 a \hat{K}^2 v}{4}\begin{vmatrix} \bar{\imath} & \bar{\jmath} & \bar{k} \\ \sin\left(\frac{v}{a}t\right) & \cos\left(\frac{v}{a}t\right) & 0 \\ \cos\left(\frac{v}{a}t\right) & -\sin\left(\frac{v}{a}t\right) & 0 \end{vmatrix} =$

$= \frac{-m_1 a K^2 v}{4} + \frac{a\hat{K}^2 v m_2}{4} \iff m_1 K^2 + m_2 \hat{K}^2 = \frac{4m_1 m_2}{m_1+m_2} \overset{3.}{\iff} \frac{\hat{K}^2 m_2}{m_1} + \hat{K}^2 = \frac{4m_1}{m_1+m_2}$

$\hookrightarrow \hat{K} = \frac{2m_1}{m_1+m_2}$, $\quad K = \frac{2m_2}{m_1+m_2}$

$\bar{r}_1^*(t) = \frac{-am_2}{m_1+m_2}\left(\sin\left(\frac{v}{a}t\right)\bar{\imath} + \cos\left(\frac{v}{a}t\right)\bar{\jmath}\right)$ $\qquad \bar{r}_2^*(t) = \frac{am_1}{m_1+m_2}\left(\sin\left(\frac{v}{a}t\right)\bar{\imath} + \cos\left(\frac{v}{a}t\right)\bar{\jmath}\right)$

$$\boxed{\begin{aligned} \bar{r}_1(t) &= R + \bar{r}_1^* = \frac{m_2}{m_1+m_2}\left(vt - a\sin\left(\frac{v}{a}t\right)\right)\bar{\imath} + \frac{m_2 a}{m_1+m_2}\left(1 - \cos\left(\frac{v}{a}t\right)\right)\bar{\jmath} \\ \bar{r}_2(t) &= R + \bar{r}_2^* = \frac{1}{m_1+m_2}\left(m_2 vt + am_1\sin\left(\frac{v}{a}t\right)\right)\bar{\imath} + \frac{a}{m_1+m_2}\left(m_2 + m_1\cos\left(\frac{v}{a}t\right)\right)\bar{\jmath} \end{aligned}}$$