Omskrivning av diffar

$$\begin{cases} \dfrac{d^2r}{dt^2} - r\left(\dfrac{d\varphi}{dt}\right)^2 = G\cos\alpha - g\dfrac{R^2}{r^2} \\ r\dfrac{d^2\varphi}{dt^2} + 2\dfrac{dr}{dt}\dfrac{d\varphi}{dt} = G\sin\alpha \end{cases}$$

$; g, G, \alpha, R \in \mathbb{R}$

Skriver om på enklare form:

$$\begin{cases} \ddot{r} - r\dot{\varphi}^2 = G\cos(\alpha) - g\dfrac{R^2}{r^2} \\ r\ddot{\varphi} + 2\dot{r}\dot{\varphi} = G\sin(\alpha) \end{cases} \Rightarrow$$

$$\begin{cases} \ddot{r} = r\dot{\varphi}^2 + G\cos(\alpha) - g\dfrac{R^2}{r^2} \\ \ddot{\varphi} = \dfrac{G\sin(\alpha) - 2\dot{r}\dot{\varphi}}{r} \end{cases}$$

Beroende variabler $r(t)$ och $\varphi(t)$.

Variabelsubstitution:

$$\bar{u} = \begin{cases} u_1 = r \\ u_2 = \dot{r} \\ u_3 = \varphi \\ u_4 = \dot{\varphi} \end{cases}, \text{ vilket ger}$$

$$\dot{\bar{u}} = \begin{cases} \dot{u}_1 = u_2 \\ \dot{u}_2 = u_1 \cdot u_4^2 + G\cos(\alpha) - g\dfrac{R^2}{\boxed{u_2}} \\ \dot{u}_3 = u_4 \\ \dot{u}_4 = \dfrac{G\sin(\alpha) - 2u_2 \cdot u_4}{u_1} \end{cases}$$

U1!!!

//