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Exercício Aula 17/09

1) $f(x) = \cos(x)$; $f(x) \approx f(\bar{x}) + \dfrac{df}{dx}\Big|_{x=\bar{x}} (x - \bar{x}) = \cos(\bar{x}) - (x - \bar{x})\operatorname{sen}\bar{x}$

a) para $\bar{x} = 0$: $f(x) = 1 - x \cdot 0 \rightarrow \boxed{f(x) = \cos(x) \approx 1}$

b) para $\bar{x} = \pi/4$: $f(x) = \cos\left(\dfrac{\pi}{4}\right) - \left(x - \dfrac{\pi}{4}\right)\operatorname{sen}\left(\dfrac{\pi}{4}\right)$

$$\boxed{f(x) = \cos(x) \approx \dfrac{\sqrt{2}}{2} - \left(x - \dfrac{\pi}{4}\right)\dfrac{\sqrt{2}}{2}}$$

2) $f(\dot{v}, r, \dot{r}, U, x) = -m\dot{v} - mrU + m\ddot{x}r = -F(t)$

$\therefore \ -F(t) \approx f(\bar{U}, \bar{r}, \bar{\dot{r}}, \bar{U}, \bar{x}) + \dfrac{\partial f}{\partial \dot{v}}\Big|_{eq}(\dot{v} - \bar{\dot{v}}) + \dfrac{\partial f}{\partial r}\Big|_{eq}(r - \bar{r}) +$

$+ \dfrac{\partial f}{\partial \dot{r}}\Big|_{eq}(\dot{r} - \bar{\dot{r}}) + \dfrac{\partial f}{\partial U}\Big|_{eq}(U - \bar{U}) + \dfrac{\partial f}{\partial x}\Big|_{eq}(x - \bar{x})$

- No equilíbrio: $\bar{r} = \bar{\dot{r}} = \bar{\dot{v}} = 0$

$-F(t) \approx f(\bar{U}, \bar{r}, \bar{\dot{r}}, \bar{U}, \bar{x}) + [-m(\dot{v} - \cancel{\dot{\bar{v}}})] + [-m\bar{U}(r - \cancel{\bar{r}})] + [m\bar{x}(\dot{r} - \cancel{\bar{\dot{r}}})] +$

$+ [-m\bar{r}(U - \bar{U})] + [m\bar{r}(x - \bar{x})]$

$- F(t) = -m\dot{v} - m\bar{U}r + m\bar{x}r$

$$\boxed{m\dot{v} = F(t) + m\bar{x}r - m\bar{U}r}$$