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Exercício Aula. 17/09/20.

1) Linearizar $f(x) = \cos x$

- $f(x) = f(\bar{x}) + \left.\dfrac{df}{dx}\right|_{x=\bar{x}} (x-\bar{x}) + O^2$

- $f(x) \sim f(\bar{x}) + \left.\dfrac{df}{dx}\right|_{x=\bar{x}} = \cos\bar{x} - \sin\bar{x}(x-\bar{x})$

a. Para $\bar{x} = 0$:

- $f(x) \approx \cos 0 - \cancel{\sin 0}^{0}(x-0) = 1$
- $f(x) \approx 1$.

b. Para $\bar{x} = \pi/4$:

- $f(x) \approx \cos \pi/4 - \sin \pi/4 (x - \pi/4)$
- $f(x) \approx \sqrt{2}/2 - \sqrt{2}/2 \cdot (x - \pi/4)$

2) Linearizar $f(\bar{v}, \bar{r}, \bar{\dot{r}}, \bar{u}, \bar{x}) = -m\dot{v} - mru + mx\dot{r} = -F(t)$

$-F(t) \sim f(\bar{v}, \bar{r}, \bar{\dot{r}}, \bar{u}, \bar{x}) + \left.\dfrac{\partial f}{\partial v}\right|_{eq}(\dot{v} - \bar{v}) + \left.\dfrac{\partial f}{\partial r}\right|_{eq}(r - \bar{r}) + \left.\dfrac{\partial f}{\partial \dot{r}}\right|_{eq}(r - \bar{r})$

$+ \left.\dfrac{\partial f}{\partial u}\right|_{eq}(u - \bar{u}) + \left.\dfrac{\partial f}{\partial x}\right|_{eq}(x - \bar{x})$

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

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

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

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