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- Linearização de $f(\theta) = \cos\theta$
  - Em torno de $\theta_0 = 0$

$$\cos(\theta) \cong \cos\theta_0 + \frac{\partial}{\partial\theta}\cdot\cos(\theta)\Big|_{\theta_0}\cdot(\theta-\theta_0) \Rightarrow$$

$$\Rightarrow \cos(\theta) \cong \cos(0) - \text{sen}(0)\cdot(\theta-\theta_0) \Rightarrow$$

$$\cos(\theta) \cong 1$$

  - Em torno de $\theta_0 = \pi/4$

$$\cos(\theta) \cong \cos(\theta_0) + \frac{\partial}{\partial\theta}\cdot\cos(\theta)\Big|_{\theta_0}\cdot(\theta-\theta_0) \Rightarrow$$

$$\Rightarrow \cos(\theta) \cong \cos(\pi/4) - \text{sen}(\pi/4)\cdot(\theta-\pi/4) \Rightarrow$$

$$\Rightarrow \cos(\theta) \cong \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}(\theta-\pi/4) \Rightarrow$$

$$\Rightarrow \cos(\theta) \cong \frac{\sqrt{2}\cdot\pi}{8} - \frac{\sqrt{2}}{2}\theta$$

- Linearização por Expansão em série de Taylor:
  - $m\dot{v} = F - mru + mx\dot{r}$
  - $\bar{\dot{v}} = \bar{r} = \bar{\dot{r}} = 0$ · Assumindo $\bar{F} = 0$
  - $m\dot{v} = f(F, r, u, \dot{r}, x)$

$$\Rightarrow f(F,r,u,\dot{r},x) = f(\bar{F},\bar{r},\bar{u},\bar{\dot{r}},\bar{x}) + \frac{\partial f}{\partial F}\Big|_{eq}\cdot(F-\bar{F}) + \frac{\partial f}{\partial r}\Big|_{eq}\cdot(r-\bar{r}) +$$

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

- Termos:
  - $f(\bar{F},\bar{r},\bar{u},\bar{\dot{r}},\bar{x}) = 0 - m\bar{r}\bar{u} + m\bar{x}\bar{\dot{r}} = 0$
  - $\frac{\partial f}{\partial F}\Big|_{eq}(F-\bar{F}) = 1\cdot(F-0) = F$
  - $\frac{\partial f}{\partial r}\Big|_{eq}(r-\bar{r}) = -m\bar{u}(r-0) = -m\bar{u}r$
  - $\frac{\partial f}{\partial u}\Big|_{eq}\cdot(u-\bar{u}) = -m\bar{r}(u-\bar{u}) = 0$
  - $\frac{\partial f}{\partial \dot{r}}\Big|_{eq}\cdot(\dot{r}-\bar{\dot{r}}) = m\bar{x}(\dot{r}-0) = m\bar{x}\dot{r}$

- $\left.\dfrac{\partial f}{\partial x}\right|_{eq} \cdot (x - \bar{x}) = m\bar{\dot{r}} \cdot (x - \bar{x}) = 0$

- Substituindo, encontra-se:

- $f = m\dot{v} = F - m\bar{u}r + m\bar{x}\dot{r}$