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PME3380 - Exercício aula 17/09

① Linearizar $\cos(x)$ p/ $x = 0$ e $\pi/4$:

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

$$\Rightarrow f(x) \tilde{=} \cos(\bar{x}) - \sin\bar{x} \cdot (x-\bar{x})$$

p/ $\bar{x} = 0$

$$f(x) \tilde{=} \cos 0 - \sin 0 \cdot (x-0) \Rightarrow \boxed{f(x) \tilde{=} 1}$$

p/ $\bar{x} = \pi/4$

$$f(x) \tilde{=} \cos\frac{\pi}{4} - \sin\frac{\pi}{4}\left(x - \frac{\pi}{4}\right) \Rightarrow f(x) \tilde{=} \frac{\sqrt{2}}{2}\left(1 + \frac{\pi}{4} - x\right)$$

② Linearizar $m\dot{v} = F(t) - m\pi v + m\dot{x}\dot{\pi}$ em torno de $\dot{\bar{v}} = \bar{\pi} = \dot{\bar{\pi}} = 0$

$$f = m\dot{x}\dot{\pi} - m\pi v - m\dot{v} = -F(t)$$

Linearizando

$$f \approx f + \left.\frac{\partial f}{\partial x}\right|_{x=\bar{x}} (x-\bar{x}) + \left.\frac{\partial f}{\partial \pi}\right|_{\pi=\bar{\pi}} (\pi-\bar{\pi}) + \left.\frac{\partial f}{\partial \dot{\pi}}\right|_{\dot{\pi}=\dot{\bar{\pi}}} (\dot{\pi}-\dot{\bar{\pi}}) + \left.\frac{\partial f}{\partial \dot{v}}\right|_{\dot{v}=\dot{\bar{v}}} (\dot{v}-\dot{\bar{v}})$$

$$+ \left.\frac{\partial f}{\partial v}\right|_{v=\bar{v}} (v-\bar{v}) \Rightarrow$$

$$\Rightarrow f \approx 0 + \cancel{m\dot{x}}^{0}(x-\bar{x}) + (-m\bar{v})(\pi-0) + m\bar{x}(\dot{\pi}-0) + (-m)(\dot{v}-0) + (-m\bar{\pi})^{0}\cdot(v-\bar{v}) \Rightarrow$$

$$\Rightarrow f \tilde{=} -m\bar{v}\pi + m\bar{x}\dot{\pi} - m\dot{v} \Rightarrow \boxed{m\dot{v} = F(t) + m\bar{x}\dot{\pi} - m\bar{v}\pi}$$