JOÃO PEDRO DIAS NUNES - 10705846 - Exercício p/ 02/10/2020.

① $f(x) = \cos x$ → expansão linear por taylor:

$$f(x) = \cos x \simeq f'(\bar{x})(x-\bar{x}) + f(x_0)$$

Para $x \approx 0 \Rightarrow f(x) \simeq -\operatorname{sen}(\bar{x})(x-\bar{x}) + \cos(\bar{x})$

$$\simeq 0\,(x-0) + 1$$

$$\simeq 1 \;//$$

Para $x \approx \frac{\pi}{2} \Rightarrow f(x) \simeq -\operatorname{sen}\left(\frac{\pi}{2}\right)\left(x-\frac{\pi}{2}\right) + \cos\left(\frac{\pi}{2}\right)$ $\Big|\; x = \frac{\pi}{4} \Rightarrow f(x) \approx -\frac{\sqrt{2}}{2}\left(x-\frac{\pi}{4}\right) + \frac{\sqrt{2}}{2}$ //

$$\simeq -\left(x-\frac{\pi}{2}\right) = \frac{\pi}{2} - x \;//$$

② $m\dot{v} = F(t) - mru + m\dot{x}r$ para $\dot{v} = \bar{r} = \dot{\bar{r}} = 0$. Q: $m\dot{v} = F - m\bar{v}r + m\bar{x}r$

Seja $f(x) = F(t) - mru + m\dot{r}x - m\dot{v}$

A forma linearizada será:

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

Para as condições acima:

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

$$f(x) = F(t) - m\dot{v} - m\bar{v}r + m\bar{x}\dot{r}. \text{ fazendo } f(x) = 0$$

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