

Nome: Yago Neves Yang

NUSP: 10772626

*PME 3380 - Lista do dia 17/09

01) $f(x) = \cos x$

$$f^*(x) = \cos \bar{x} - \sin \bar{x} \cdot (x - \bar{x}) \quad \begin{cases} \bar{x} = 0 \rightarrow \cos x = 1 \\ \bar{x} = \frac{\pi}{4} \rightarrow \cos x = \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} \cdot \left(x - \frac{\pi}{4}\right) \end{cases}$$

02) $m\ddot{v} = F - mru + mx\dot{r} \Rightarrow F = m\ddot{v} + mru - mx\dot{r} = f(x, u, r, \dot{r}, \ddot{v})$

Obs.: $\ddot{v} = \ddot{r} = \ddot{r} = 0$

$$\begin{aligned} f(x, u, r, \dot{r}, \ddot{v}) &= f(\bar{x}, \bar{u}, \bar{r}, \bar{r}, \bar{v}) + \frac{\partial f}{\partial x} \Big|_{\bar{x}, \bar{u}, \bar{r}, \bar{r}, \bar{v}} (x - \bar{x}) + \frac{\partial f}{\partial u} \Big|_{\bar{u}, \bar{x}, \bar{r}, \bar{r}, \bar{v}} (u - \bar{u}) + \frac{\partial f}{\partial r} \Big|_{\bar{r}, \bar{x}, \bar{u}, \bar{r}, \bar{v}} (r - \bar{r}) + \\ &\quad + \frac{\partial f}{\partial \dot{r}} \Big|_{\bar{r}, \bar{x}, \bar{u}, \bar{r}, \bar{v}} (\dot{r} - \bar{r}) + \frac{\partial f}{\partial \ddot{v}} \Big|_{\bar{v}, \bar{x}, \bar{u}, \bar{r}, \bar{r}} (\ddot{v} - \bar{v}) \end{aligned}$$

$$\begin{aligned} f(x, u, r, \dot{r}, \ddot{v}) &= \underset{0}{m\ddot{v}} + \underset{0}{m\dot{r}\bar{u}} - \underset{0}{m\ddot{r}\bar{r}} - \underset{0}{m\dot{r}(x - \bar{x})} + \underset{0}{m\dot{r}(u - \bar{u})} + \underset{0}{m\bar{u}(r - \bar{r})} - \underset{0}{m\bar{x}(\dot{r} - \bar{r})} + \\ &\quad + \underset{0}{m(\ddot{v} - \bar{v})} \end{aligned}$$

$$f(x, u, r, \dot{r}, \ddot{v}) = m\bar{u}\dot{r} - m\bar{x}\dot{r} + m\ddot{v} \Rightarrow \boxed{m\ddot{v} = m\bar{x}\dot{r} - m\bar{u}\dot{r} + F}$$