Ex 17109 - Henrique Kuhlmann - 10772672

1) a) $f(x) = \cos(x)$ $f(0) = 1$ $f'(x) = -\operatorname{sen} x$ $f'(0) = 0$

$P_0(x) = f(0) + f'(0) \cdot (x - 0) \rightarrow \boxed{P_0(x) = 1}$

b) $f(x) = \cos x$ $f(\pi/4) = \sqrt{2}/2$ $f'(x) = -\operatorname{sen} x$ $f'(\pi/4) = -\sqrt{2}/2$

$P_{\pi/4}(x) = f(\pi/4) + f'(\pi/4) \cdot (x - \pi/4) \rightarrow \boxed{P_{\pi/4}(x) = \frac{\sqrt{2}}{2}\left(\frac{1 + \pi}{4} - x\right)}$

2) $\dot{v} = x\dot{r} - ru + f(t) = z(x, r, u, \dot{r}, t)$ $\quad \bar{r} = 0, \ \dot{\bar{r}} = 0$

$\bar{z} = \bar{x}\dot{\bar{r}} - \bar{r}\bar{u} + \bar{f} = 0 \rightarrow \bar{f} = 0$

$\frac{\partial z}{\partial u} = -r, \ \left.\frac{\partial z}{\partial u}\right|_{eq} = -\bar{r} = 0 \qquad \frac{\partial z}{\partial \dot{r}} = x, \ \left.\frac{\partial z}{\partial \dot{r}}\right|_{eq} = \bar{x}$

$\frac{\partial z}{\partial x} = \dot{r}, \ \left.\frac{\partial z}{\partial x}\right|_{eq} = 0 \qquad \frac{\partial z}{\partial r} = -u, \ \left.\frac{\partial z}{\partial r}\right|_{eq} = -\bar{u}$

$\frac{\partial z}{\partial f} = 1, \ \left.\frac{\partial z}{\partial f}\right|_{eq} = 1$

$\dot{v}_l = \dot{\bar{v}}^{0} + \bar{x}(\dot{r} - \dot{\bar{r}})^{0} + (-\bar{u})(r - \bar{r})^{0} + 1(f - \bar{f})^{0}$

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