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① $f(x) = \cos x$

$$f(x) = F(x_0) + \frac{df}{dx}(x - x_0)\Big|_{x=x_0}$$

$$fx = \cos(x_0) - \sin(x_0)(x - x_0)$$

$x = 0 \therefore f(x) = 1$

$x = \frac{\pi}{2} \quad f(x) = 0 - 1\left(x - \frac{\pi}{2}\right) = \frac{\pi}{2} - x$

② $m\dot{v} = F - m\dot{v}u + m\dot{x}\dot{r}$

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

sendo $\bar{v} = \bar{r} = \bar{v} = 0$

$$F = f + \frac{\partial f}{\partial x}(x - \bar{x}) + \frac{\partial f}{\partial u}(u - \bar{u}) + \frac{\partial f}{\partial r}(r - \bar{r}) + \frac{\partial f}{\partial i}(\dot{r} - \bar{r})$$

$$+ \frac{\partial f}{\partial \dot{v}}(\dot{v} - \bar{v})$$

$F = m\bar{v} + m\bar{r}\bar{v} - m\bar{r}\bar{r} - m\bar{r}(x - \bar{x}) + m\bar{r}(u - \bar{u}) +$

$m\bar{u}(r - \bar{r}) - m\bar{x}(\dot{r} - \bar{r}) + m(\dot{v} - \bar{v})$

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