a) $N - mg = m(-R\omega^2 \operatorname{sen}\varphi) \Rightarrow N = -mR\omega^2 \operatorname{sen}\varphi + mg$

$-T = m(\ddot{x} - R\omega^2 \cos\varphi)$

Como desliza: $T = f_D N$

$$-f_D N = m(\ddot{x} - R\omega^2 \cos\varphi)$$

$$f_D(\cancel{m}R\omega^2 \operatorname{sen}\varphi - \cancel{m}g) = \cancel{m}(\ddot{x} - R\omega^2 \cos\varphi)$$

$$f_D R\omega^2 \operatorname{sen}\varphi - f_D g = \ddot{x} - R\omega^2 \cos\varphi$$

$$\Rightarrow \ddot{x} = f_D R\omega^2 \operatorname{sen}\underbrace{\varphi}_{\omega t} - f_D g + R\omega^2 \cos\underbrace{\varphi}_{\omega t}$$

$$t = 0 \Rightarrow \ddot{x} = R\omega^2 - f_D g$$

$$\vec{v} = (\dot{x} - R\omega \operatorname{sen}(\omega t))\hat{\imath} + R\omega \cos(\omega t)\hat{\jmath}$$

Necesito $\dot{x}$: $\dot{x} = \int \ddot{x}\, dt$

$$\dot{x} = \int_0^t (R\omega^2 - f_D g)\, dt = R\omega^2 t - f_D g t = (R\omega^2 - f_D g)t$$

$$\vec{v} = ((R\omega^2 - f_D g)t - R\omega \operatorname{sen}(\omega t))\hat{\imath} + R\omega \cos(\omega t)\hat{\jmath}$$

Solo me interesa la componente horizontal: $\vec{v}_x = ((R\omega^2 - f_D g)t - R\omega \operatorname{sen}\omega t)\hat{\imath}$