



$$g(x, y) = g(x_0, y_0) + \frac{\partial g}{\partial x}\bigg|_{x_0, y_0} (x - x_0) + \frac{\partial g}{\partial y}\bigg|_{x_0, y_0} (y - y_0)$$

$$x y^2 \approx x_0 y_0^2 + (y_0^2)(x - x_0) + (2x_0 y_0)(y - y_0)$$

$$x(\dot{\theta})^2 \approx 0 + 0 + 0 = 0$$

x_0

$\dot{\theta}_0 = 0$