

$$\dot{\theta} = \left(\theta - \frac{\theta^3}{6} \right) \left(\mu + 1 - \frac{\theta^2}{2} \right)^{-1} = \frac{1}{\mu + 1} \left(\theta - \frac{\theta^3}{6} \right) \left(1 + \frac{\theta^2}{2(\mu + 1)} \right)$$

$$\dot{\theta} = \frac{1}{\mu + 1} \left(\theta + \left(\frac{1}{2(\mu + 1)} - \frac{1}{6} \right) \theta^3 \right)$$