# Homework 3: Task 1

The dynamics of the cart-pendulum system are

$$\begin{aligned} 2 \cdot \ddot{x} + \cos\theta \cdot \ddot{\theta} - \sin\theta \cdot \dot{\theta}^2 &= f \\ \cos\theta \cdot \ddot{x} + \ddot{\theta} - g \cdot \sin\theta &= 0 \end{aligned}$$

where $x$ is a coordinate for representing a position of the cart; $\theta$ is an angle the pendulum makes with the vertical; and $f$ is an external force (control signal) that can be applied to the cart. The task is to find an external force (feedforward control signal) such that in response the pendulum of the system comes over a wall without collision.