Nonlinear Control Systems

Homework #6

(Due date: May 2, 2012)

April 24, 2011

1. Consider the following system that represents a linearized model of the inverted pendulum

$$G(s) = \frac{\theta(s)}{u(s)} = \frac{1}{s^2 - 1}.$$

Design a sliding mode control law for this system with a sliding manifold in the $(\theta, \dot{\theta})$-plane given by $s = \dot{\theta} + \theta$. Comment on the expected behavior of the closed-loop system when compared with the use of the signum nonlinearity and its saturation function approximation $\text{sat}(s/\epsilon)$.