Problem: Simple Pendulum

Simple Pendulum

0.0/10.0 points (graded)

The lecture introduced the simple pendulum as a benchmark nonlinear system. Recall that the second-order dynamics of a damped pendulum are

$$ml^2\ddot{\theta} + mgl\sin\theta = -b\dot{\theta} + u$$

Consider the case where the control input u takes on a constant value. Take the constants $m = 3$, $l = 1$, $g = 10$, and $b = 2$. Plot (but do not submit) the bifurcation diagram $\theta^* vs. u$ showing the equilibrium point(s) for a fixed u. Note what happens when u increases to 30 and above.

For $u = 10$, provide the equilibrium point(s) as a comma-separated list $\theta_1, \theta_2, \ldots$. Ensure that the number of equilibrium points is correct (no duplicate entries). The error tolerance for each element in the list is 10^{-3}. Restrict your answers to the interval $(-\pi, \pi]$.

Answer: 0.339837,2.801756

0.339837,2.801756

Do the same for $u = 30$.

Answer: 1.570796

1.570796

Submit You have used 0 of 1 attempt

Answers are displayed within the problem