

Homework #2

Due 4/18

2.1 First show that $\dot{x}_1 = -x_1 + x_1^2 e^{-t} c$ has finite escape time for some $x_1(0)$ and c .

Then design a GAS stabilizer for $\dot{x}_1 = -x_1 + x_1^2 x_2$, $\dot{x}_2 = u - x_2^3$

2.2 For the system $\dot{x}_1 = x_2$, $\dot{x}_2 = x_1 - x_1^3 + u$ verify that $V = \frac{1}{4}x_1^4 + \frac{1}{2}x_1^2 + \frac{1}{2}x_2^2$ can be used to find $u = -\varphi(x)$ to make $\dot{V} \leq -W(x)$, such that for $W(x)$ semidefinite the invariance principle gives GAS. Next design a stabilizer for $\dot{x}_1 = x_2$, $\dot{x}_2 = x_1 - x_1^3 + x_3$, $\dot{x}_3 = u$.

2.3 Solve 14.38 in the textbook.