MAE 281A

NONLINEAR SYSTEMS Prof. M. Krstic

Homework 5

Due March 7, 2000

1. Khalil, Exercise 3.41.

   Hint: In part (b), study (local) u.a.s. of the solution $x(t) = \begin{bmatrix} 1 \\ t \end{bmatrix}$.

2. Khalil, Exercise 5.5.
   Hint: Use completion of squares in $\dot{V}$.

3. Khalil, Exercise 5.18, Parts (a)–(c).
   Hint: In part (c), show that stability is not *global* by showing that there exist multiple equilibria.

4. Khalil, Exercise 5.21, Parts (2) and (3).

5. Khalil, Exercise 5.22, Parts (1) and (4).
   Hints:

   - Part (1): use Lemma C.4 in [KKK].
   - Part (4): use Young's inequality which gives $x_1 u_1 \leq \frac{1}{2}x_1^2 + \frac{1}{2}u_1^2$ and $x_2 u_2 \leq \frac{1}{4}x_2^4 + \frac{3}{4}u_2^{4/3}$; then apply Theorem C.3 in [KKK].