

## Additional Exercises for Chapter 3

1. Consider the scalar system

$$\dot{x} = -(1+x^2)x^3 \stackrel{\text{def}}{=} f(x)$$

- (a) Is  $f(x)$  locally Lipschitz? Is it globally Lipschitz?
- (b) Using the comparison lemma, show that  $x(t)$  satisfies

$$|x(t)| \leq \frac{|x(0)|}{\sqrt{1+2t|x(0)|^2}}, \quad \forall t \geq 0$$

- (c) Can  $x(t)$  have a finite escape time?