AMATH 383 Homework Assignment #2
(Due in class: Thu., October. 17)

1. Exercise 4 of Chapter 2 of the textbook. Please note that there is a typo in the formula in part c: an exponent $\frac{1}{4}$ was missing. It should be

$$\frac{dR}{dt} = -\left(\frac{a}{4M^{\frac{1}{4}}}\right) R.$$

2. Exercise 7 of Chapter 2.

3. Exercise 7 of Chapter 3.

4. Exercise 4 of Chapter 4.

5. Consider a problem in pharmacokinetics concerned with the dose-response relationship of a drug with its rate of clearance λC^2, where $C(t)$ denotes the concentration of the drug in a patient 's body at time t. Let C_0 be the concentration at time $t = 0$, then

$$\frac{dC}{dt} = -\lambda C^2. \tag{1}$$

Now suppose constant doses C_0 are given at equal intervals of time T.

(a) Find the amount of drug in the body immedately after the n^{th} dose, C_n, in terms of that after the $(n-1)^{th}$ dose, C_{n-1}.

(b) As n tends to infinity, what is the *steady state* concentration of the drug in the body?

Extra credit: Consider the model of a continuous intravenous injection with rate I:

$$\frac{dC}{dt} = -\lambda C^2 + I. \tag{2}$$

Solve the $C(t)$ and compare $C(\infty)$ with the result in (b).