AMATH 383 Homework Assignment #2
(Due in class: Thu., Jan. 21)

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 \( \lambda C^2 \), 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
   \[
   \frac{dC}{dt} = -\lambda C^2.
   \]  
   \[ (1) \]

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

(a) Find the amount of drug in the body immediately after the \( n^{th} \) dose.

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

(c) Consider the model of a continuous intravenous injection with rate \( I \):
   \[
   \frac{dC}{dt} = -\lambda C^2 + I.
   \]  
   \[ (2) \]

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