

Differential Equations – Homework 7

Professor:

Dr. Joanna Bieri

joanna_bieri@redlands.edu

Homework 7

Directions: Do the following book problems

From the book:

Chapter 1 Review Problems: 4, 7, 10, 33

Chapter 2.1 Problems: 2, 9, 11, 12

Other Notes:

1. Take advantage of Dfield to draw solution curves. You can also use Desmos.com to plot your final solutions. Graphs and Plots are really helpful in applied problems!!
2. Applied problems can be overwhelming, the best way to approach them is to work on one thing at a time:
 - First write down everything you are given and try to translate into math as much as possible. Ex. I hear rate of change and I think derivative.
 - Draw diagrams for the system being modeled. Sometimes this is a sketch of the problem sometimes it is a compartmental diagram like in class.
 - Now figure out the equations you need to solve.
 - Then solve the equations using methods you know or just learned.
 - Always ask if your answer makes sense. Graphing your solution really helps!
3. When the book says “logistic population” they mean a population that satisfies

$$\frac{dP}{dt} = R \left(1 - \frac{P}{K} \right) P$$

where R is the max growth rate and K is the carrying capacity or population limit. You are usually given a few pieces of information that you can plug in to solve for R and K .

The book writes this equation a little differently. Eqn (3) on page 79:

$$\frac{dP}{dt} = kP(M - P)$$

where $k = \frac{R}{K}$ and $M = K$ to translate this back to our variables. In general you can use either form of the equation.