

## Homework 1

Assigned: Friday September 11

Due: Friday September 18

Unfortunately *I cannot accept homework after the due date*. I will hand out solutions, at least to a selection of problems, on the day when the homework is due, and in any case it seems to me that a strict due date is desirable to make sure that everybody gets equal treatment.

Problems with no stars: These are problems that I consider suitable exam questions. When I make the exams, I will go over these problems and make up variations of them.

\* Problems with one star: These are problems that I expect everybody to do, but that I don't consider suitable exam problems for some reason (usually because the solution is a little bit too long for an exam).

\*\* Problems with two stars: These are problems that, in my estimate, are a little more challenging. You should do them. If you do, you'll get extra credit. If you don't, you'll be forgiven.

1. p. 36, problems 2.1.1 through 2.1.3. (Some of the solutions are in the back of the book. Feel free to look at them, but explain the solutions in more detail than the book does, to be sure that you really understand how to do them!)

2. p. 37, problem 2.2.1. Do all the things that the book asks you to do, then try to find a general formula for the solution with  $x(0) = x_0$ . It's not too hard, even if you have not taken Math 38. You use the same trick as for  $\dot{x} = rx$ . It's lengthier than for  $\dot{x} = rx$  though. Please write the solution in the way in which I wrote it for  $\dot{x} = rx$ . (Avoid multiplying by undefined quantities such as  $dt$ .)

3. p. 37, problems 2.2.8 and 2.2.9. (Hint: It is good to first try to *draw*  $f$ , instead of writing down a formula right away.

\* 4. p. 39, problem 2.3.4. In part a), think about which conditions  $r$ ,  $a$ , and  $b$  ought to satisfy for the model to make sense. (You can see this best by sketching  $r - a(N - b)^2$  as a function of  $N$ .) The most interesting case is that in which there is no negative fixed point. Explain what is the significance of the middle fixed point in that case.

\*\* 5. p. 41, problem 2.5.6. (At least look at the problem — it's cute! It's not hard if you are comfortable with very elementary physics.)