

Homework 3

Due: Friday, October 9 (You will get a new assignment on October 2, which will also be due on October 9, so please work on this one this week if you can.)

1. Page 84, problem 3.4.16.

* 2. Last week we discussed in class the overdamped bead, anchored by a spring, on a vertical wire. Afterwards, several of you came to me and said: “Why not simply use $T = b/k$, instead of the more complicated choice that you used?” I had overlooked that. Being an experienced professor, I am turning my mistake into a homework problem. (Unfortunately I didn’t think of claiming right away that I had planned it that way all along...)

Work out the non-dimensionalized equation that you get in the overdamped limit ($b \rightarrow \infty$) if you use $T = b/k$. Do the complete non-dimensionalization, i.e. go from $x = x(t)$ to $z = z(\tau)$. It is all quite similar to what we did in class. How does the equation that you get differ from the one we got in class?

3. p. 86, problem 3.6.4. Draw the catastrophe surface. Indicate which portion corresponds to unstable fixed points, and which corresponds to stable ones.

4. p. 113, problem 4.1.1.

5. p. 113, problems 4.1.2, 4.1.3, 4.1.5. Where appropriate, add the words “fast” and “slow”, as in Fig. 4.3.3(a) on p. 97. *Hint:* To do problem 4.1.5, think before plotting!