Homework 11

Math 469, Spring 2024

This homework is due on MONDAY, April 8 at 11:30 am. (Turn in your answers – via Gradescope – to questions 1–5.)

0. *(This problem is not to be turned in.)*
   (a) Read about the **Routh-Hurwitz criterion** and the related examples in Section 4.5 (the first page of this section was a handout in class recently). How does the criterion in the textbook differ from versions found in some online sources?
   (b) Read Sections 5.1–5.5 and 5.7.

1. Use the Routh-Hurwitz criterion to find conditions on $b \in \mathbb{R}$ so that all solutions of the following differential equation approach zero:
$$\frac{d^3x}{dt^3} + b\frac{d^2x}{dt^2} + \frac{dx}{dt} + 2x \;=\; 0 \;.$$

2. Find conditions on $\alpha \in \mathbb{R}$ and $\beta \in \mathbb{R}$ so that all solutions of the following differential equation approach zero:
$$\frac{d^2x}{dt^2} \;=\; \alpha\frac{dx}{dt} + \beta x \;.$$

3. Find a general solution to the following differential equation, where $c > 0$ and $d > 0$:
$$\frac{dB}{dt} \;=\; d - cB \;.$$
   Find the equilibria and their stability. (How) Does your answer depend on c and d?

4. Section 5.13 #3, 4(b), 6

5. (This part of your homework pertains to the final project.) *This week, you will critique another student's draft.*
   (a) Read through the draft. Mark each spot you got confused.
   (b) What questions do you have for the authors?
   (c) Is each of the three required sections (introduction, background, results) adequate?
   (d) What aspects of the draft did you like?
   (e) What could the authors do to improve their draft?
   (f) SUBMISSION - PART 1. You must upload your comments and the draft (any pages of the draft where you marked / gave comments) to Gradescope. *Please ensure that your answers to (b)–(e) are labeled and easily found.*
   (g) SUBMISSION - PART 2. *Staple your comments to the draft, and make sure both your name and the authors' names appear on the front. Bring this to class on Monday, April 8.*