MATH 354: PROBLEM SET 9

RICE UNIVERSITY, FALL 2019

Due date: Friday, November 15th, by 5pm in my office (you can slide it under the door). You are welcome to turn in your work during lecture on Friday.

Parts A, and B should be handed in **separately**. They will be graded by different TAs.

Please staple your homework!

Reminder from the syllabus: "The homework is not pledged and you can collaborate with other students in the class. In fact, you are very much *encouraged* to do so. However, you are not allowed to look up solutions in any written form; in particular, you are not allowed to look up solutions online. **Students caught violating this rule will be reported to the Honor Council.** You should write up your solutions individually."

1. PART A

Hand in the following exercises from Chapters 5 and 6 of Axler's book:

$$\text{5C: 7, 9, 16.} \quad \text{6A: 5, 10.}$$

2. PART B

Hand in the following exercises from Chapter 6 of Axler's book:

$$\text{6A: 11, 22.} \quad \text{6B: 3, 4, 5, 8.}$$

3. COMMENTS

(1) Problem 5C.16 is not tricky (it's been subdivided into many parts to help). You get a formula for the Fibonacci numbers using linear algebra! And you get to see the Golden Ratio pop out as an eigenvalue. Part (a) is most easily done using induction.

(2) Problems 6A.11 and 6A.22 are applications of the Cauchy-Schwarz inequality in $\mathbb{R}^4$ and $\mathbb{R}^n$, respectively, using the usual dot product as an inner product. Your task is to choose vectors in these spaces judiciously to get the desired inequality.

(3) Problems 6B.3 and 6B.5 are good practice with the Gram-Schmidt algorithm. For 6B.3 take a look at the *proof* of 6.37; for 6B.5 example 6.33 should be of help.

Date: November 8th, 2019.

(4) Problem 6B.8 is an exercise on the Riesz representation theorem. Example 6.44 will probably help here.