MATH 311 Advanced Linear Algebra
Homework 4

Basic Information

This assignment is due in the correct folder in Google Drive by **4 PM on Friday, February 21**. Any part of the assignment you LaTeX can be turned in by 10 PM without penalty.

Make sure you understand MHC honor code and have carefully read and understood the additional information on the class syllabus and the grading rubric. I am happy to discuss any questions or concerns you have!

You are always welcome to ask me for small hints or suggestions on problems.

Problems

1. **P.2.13** When the problem says "show" think of it as saying you should prove it.
2. These two problems are quick computations but they give examples of seeming "exceptions" to things we know. Briefly show your algebra and answer the question in (b). No need to write a lot of explanation of the algebra on these.
   (a) **P.2.14** (This says that the converse of Theorem 2.6.8 is NOT true).
   (b) **P.2.37**
3. **P. 2.40**
4. **P.3.5** By "verify" the problem means the following: show that the i, j entry of the matrix on the right side of (3.1.15) is identical to the i, j entry of the right side of (3.1.17) using the forms they are written in on the right sides.
5. **P.3.17** (A and B *commute* if $AB = BA$).
6. The process of finding the $\beta - \gamma$ change-of-basis matrix ${}_{\gamma}[I]_{\beta}$ from basis β to basis γ requires us to compute $[\overrightarrow{v_i}]_{\gamma}$ for each $\overrightarrow{v_i} \in \beta$. Notice that doing this requires finding c_i so that $\overrightarrow{v_i} = c_1\overrightarrow{w_1} + c_2\overrightarrow{w_1} + \cdots + c_n\overrightarrow{w_1}$. This can be rewritten to say we want to solve the equation $[\overrightarrow{w_1}\ \ \overrightarrow{w_2} \ldots \overrightarrow{w_n}]\begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_n \end{bmatrix} = \overrightarrow{v_i}$ for each i. Write a function that inputs β and γ as 3×3 arrays and outputs the three columns of the change of basis matrix. If you want an extra challenge (no extra points) write your program to work for any $n \times n$ bases. I have updated the python notes to talk about writing your own functions and the "solve" command in np.linalg. Example 2.6.6 on page 41 of the book would be a good example to test your program on. You should ultimately submit a ".py" file either that you wrote yourself or that you exported from JupyterHub (see the python notes).