

MATH 342 SECTION 33650
WRITTEN HOMEWORK 9
DUE JUNE 4, 2018.
INSTRUCTOR: ROBERT LIPSHITZ

Required textbook problems (hand these in):

- (1) §7.4: 7, 10, 14, 17.
- (2) §7.5: 2, 4.

Suggested practice (don't hand these in):

- Please read and make sure you can do the practice problems in Sections 7.4 and 7.5.
- If you have some experience writing proofs, try exercises 7.4.18, 7.4.19, 7.4.21, 7.4.25.
- If you had trouble or got help with any of the assigned problems, solve another, similar problem (or two).

Bonus points. Sage.

- Work through the blog post “Singular weather decomposition.”
- Optional: use the Sage to check your answers to the assigned problems.
- Create a 3×3 matrix A with rank 2. Add a small, random error to each entry; call the resulting matrix B . (The Sage command `random()` might help here.) What is the rank B ? (Have Sage compute it for you.) How do the singular values of A and B compare? (Singular value decomposition, unlike rank, is numerically stable; this is also mentioned in the “numerical note” in Section 7.4 of the textbook. So, if you are working with real data, you always want to use the SVD (or something similar) rather than the rank.)
- Get some weather data of your own from the NOAA (as discussed in the blog post), or if you prefer some other data, take the singular value decomposition, and interpret the results. Add some written comments about the data you looked at and what you observed.

This is the last written homework assignment of the course.

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