

MATH 342 SECTION 33650
WRITTEN HOMEWORK 4
DUE APRIL 25, 2016.
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Required textbook problems (hand these in):

- (1) §5.4: 5, 10, 11, 14.
- (2) Let $V = \{a_0 + a_1e^x + a_2e^{2x} + a_3e^{3x} \mid a_1, a_2, a_3 \in \mathbb{R}\}$, which is a subspace of the vector space of functions $\mathbb{R} \rightarrow \mathbb{R}$. Let $T: V \rightarrow V$ be the linear transformation $T(f(x)) = f''(x)$. What are the eigenvalues of T ? Find an eigenvector corresponding to each eigenvalue.
- (3) Consider the linear transformation $T: \mathbb{P}_2 \rightarrow \mathbb{P}_2$ given by $T(p(x)) = p(0) + p(1) + p'(x) + 3x^2p''(x)$. Let $\mathcal{B}$ be the basis $\{1, x, x^2\}$ for $\mathbb{P}_2$.
 - (a) Find the matrix A for T with respect to the basis $\mathcal{B}$.
 - (b) Find the eigenvalues of A , and a basis for $\mathbb{R}^3$ consisting of eigenvectors of A .
 - (c) Find a basis for $\mathbb{P}_2$ consisting of eigenvectors for T .
- (4) §5.5: 4, 5, 7
- (5) Let $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$. Compute A^{20} (by hand).

Suggested practice (don't hand these in):

- Please read and make sure you can do the practice problems in Sections 5.4 and 5.5.
- If you have taken a course on writing proofs, try problems 5.4.25, 5.4.26, 5.4.19, 5.4.20, 5.4.21, 5.4.23.
- If you had trouble or got help with any of the assigned problems, solve another, similar problem (or two).

Bonus points. Sage, as usual. For this week:

- (1) Work through the blog post “complex numbers in Sage”.
- (2) Use Sage to check your answers to 5.4.11, 5.4.14, 5.5.4, and 5.5.5.

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