

Homework Set 11 (Revised)

Read pp. 163–176, 179–182, 213–216.

Change of Basis

- (4 points) page 244, number 4
- Consider the transformation $T \in \mathcal{L}(\mathcal{P}_2)$, where $T(p(x)) = p(x) + xp'(x) + p''(x)$. Furthermore, let $E = \{1, x, x^2\}$ be the standard basis for \mathcal{P}_2 .
 - (3 points) Write ${}_{E \leftarrow E}T$.
 - (3 points) Find a basis Z for \mathcal{P}_2 such that ${}_{Z \leftarrow Z}T$ is diagonal.
 - (3 points) Verify Theorem 10.3.

Polynomials of an Operator

- Find the minimal and characteristic polynomials for each of the following operators:
 - (4 points) $V = \mathcal{R}^{n \times n}$, $T(A) = A^T$.
 - (4 points) Given a particular nonzero $\mathbf{u} \in \mathcal{C}^n$, let $T = I - 2\mathbf{u}\mathbf{u}^*$.
- Let

$$q_T(X) = X^m + \sum_{j=0}^{m-1} a_j X^j.$$

- (3 points) Show that T is invertible if and only if $a_0 \neq 0$.
- (3 points) page 190, number 20

The Cayley-Hamilton Theorem

- (6 points) page 190, number 23
- (7 points) page 191, number 30