Homework 7
MATH 416: Abstract Linear Algebra
Due date: April 4, 2018

Textbooks: In the assignment, the two texts are abbreviated as follows:


1. Section 5.1 of [FIS], Problem 1.
2. Section 5.1 of [FIS], Problem 2 parts (a) and (c).
3. Section 5.1 of [FIS], Problem 3(a).
4. Section 5.1 of [FIS], Problem 4 parts (b) and (h).
5. Let $T$ be a linear operator on a finite-dimensional vector space $V$.
   (a) Show that $T$ is invertible if and only if 0 is not an eigenvalue of $T$.
   (b) If $T$ is invertible, show that $\lambda^{-1}$ is an eigenvalue of $T^{-1}$ if and only if $\lambda$ is an eigenvalue of $T$.
6. Suppose $T : V \to V$ is a linear operator with $V$ finite-dimensional. Suppose $v \in V$ is an eigenvector of $T$ with eigenvalue $\lambda$. As usual, $T^m : V \to V$ denotes composition of $T$ with itself $m$ times. Prove that $v$ is also an eigenvector for $T^m$ and give a formula for the corresponding eigenvalue.
7. Prove that similar matrices have the same characteristic polynomial.
8. Section 5.2 of [FIS], Problem 1 parts (a) to (g).
9. Section 5.2 of [FIS], Problem 2, parts (e) and (g).
10. Section 5.2 of [FIS], Problem 3, parts (a) and (d).