Read Section 8.D of Axler's Linear Algebra Done Right. Throughout the section, assume that V is a finite-dimensional vector space. It may also be helpful to reread Section 7.1 of Friedberg et al.

1. Recall the definition of a cycle of generalized eigenvectors of T from Section 7.1. Based on the examples in 8.D, does every nilpotent operator have a basis given by a cycle of generalized eigenvectors?

2. What is the general strategy of the proof of Theorem 8.55? For example, is it a proof by contradiction?

3. Axler writes that since the nilpotent operator N is not injective, it must also not be surjective. Why is this true for any operator on a finite-dimensional vector space?

4. At the end of the proof of Theorem 8.60, Axler finds a Jordan basis for a nilpotent operator on each generalized eigenspace. Why does the union of these form a Jordan canonical basis for the operator T?

5. (Optional) We may have some flexibility in the topics we cover in the last week of class. Some options could include: bilinear forms, quadratic forms, rational canonical form, Smith normal form, or multilinear algebra and tensor products. Is there a topic you'd particularly like to learn more about? You may suggest topics that are not on this list.