

Math 53: 5% Assessment #3

There are two main goals of this project: (1) To gain some understanding and experience in a linear algebra application using eigenvalues and eigenvectors, and (2) to practice writing clear and understandable mathematical prose. For this project you will:

1. Choose a 2×2 matrix of numbers that represent the changes in the size of a predator-prey relationship. You may make up any numbers, but they should be reasonable given whatever sorts of predators and prey make up your project. You will not lose any points for not knowing the exact number of gazelles a cheetah consumes monthly, but your matrix should have values which correspond to the roles of predator and prey, as the class example did.
2. **Special Note.** You will be required to choose parameters for your matrix to at least *three, distinct* significant digits, and to carry as many digits through out your work. That is, using a matrix entry of 1.1 is not acceptable, but 1.36 is.
3. Conduct an eigenvalue/eigenvector analysis of your matrix, following the model of Section 5.6 in your text (which is also what we did in class). Use this to determine the long-term scaling factor for your populations (the " λ_1 ") and the long-term distribution of predators to prey (the " \vec{v}_1 "). You may use technology to determine the eigenvalues of your matrix, but if you do, explain what you did.
4. Write a 3×3 matrix model portraying the population dynamics among *three* animals. One should be a predator P for whom the other two are prey, one is prey R to both of the others, and one Q is prey to P and a predator to R . You do *not* have to do an eigenvalue analysis on this model. You need only state it, and explain why the parameters you chose (that you made up) indicate that the animals P, Q, R have the relationships required in the problem.

You may show me drafts or partial drafts *at any time*, and are encouraged to do so. Please allow, however, 24 hours for most responses. That is, I will *not* respond to drafts at the moment they are sent. Most points are lost because of incomplete projects, or sloppy work, so be careful. The project is officially due by the start of the final. If, for whatever reason, you feel this will be problematic, please contact me and we will work to find a solution.