# Project 8E - Eigenvalues

Due 4-10

The goal of this exercise is to take a step towards computationally determining the eigenvalues of a matrix.

Consider a system that has two energy levels. In a given amount of time, $\tau$, half of the electrons in level 0 get excited and jump to energy level 1. Also, in that same amount of time 10% of the electrons in level 1 drop back to level 0. Suppose we start with all of the electrons in level 0, we'd like to determine the fraction of electrons in level 0 after some time $t = N * \tau$.

1. In class: Explain (or be explained) how to determine the eigenvector corresponding to a particular eigenvalue.

2. In class: Write a set of two equations that represent the fraction of electrons in levels 0 and 1 (at the end of time $\tau$) as a function fo the fraction of electroncs in levels 0 and 1 (at the beginning of time $\tau$).

3. In class: Represent this set of equations in matrix form.

4. In class: By hand, determine the eigenvalues of this matrix.

5. In class: By hand, determine the eigenvectors of this matrix.

6. Computationally determine the fraction of electrons in each energy level after 3 $\tau$. If you do not have a working matrix class with a multiply feature, use someone else's BUT CLEARLY STATE THIS AND GIVE CREDIT TO WHOSE YOU DID USE IN A COMMENT AT THE TOP OF YOUR FILE.

7. Computationally determine the fraction of electrons in each energy level after 100 $\tau$. This should correspond to the eigenvector for the larger eigenvalue.

8. @ Review. Determine the moment of inertia of a sphere (respect to an axis through its center) of mass 10 kg and radius 0.2 m.

Due Friday, April 12th.