Homework 7
Due: Wednesday, June 10

0. Solve Q.3 from Quiz 2 if you did not get it then. The superposition principle is very fundamental to the theory of linear DE's and you should understand it very well.

For each of the following matrices:

- Draw the images of the standard basis vectors under the corresponding linear transformations as best as you can.
- Find the trace, the determinant and determine if the matrix is invertible, and if it is find the inverse.
- Find the characteristic polynomial, the eigenvalues and the corresponding eigenvectors of the following matrices.

(Assume that $a > b > 0$ are distinct positive constants and $\theta \in [0, 2\pi]$.)

1. $\begin{bmatrix} 2 & -1 \\ 0 & 3 \end{bmatrix}$
2. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
3. $\begin{bmatrix} 0 & 0 \\ a & b \end{bmatrix}$
4. $\begin{bmatrix} 0 & a \\ 0 & b \end{bmatrix}$
5. $\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$
6. $\begin{bmatrix} 1 & 0 \\ a & 1 \end{bmatrix}$
7. $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$
8. $\begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$
9. $\begin{bmatrix} \cos\theta & -\sin\theta \\ -\sin\theta & -\cos\theta \end{bmatrix}$
10. $\begin{bmatrix} a & b \\ b & a \end{bmatrix}$