

Math 1553 Worksheet §6.1

1. Sing the eigenvector song: ♪ *an eigenvector is a v where A times v is λv .* ♪
2. Determine whether the following statements are always true or sometimes false. In the latter case, correct it to make a true statement.
 - a) A matrix A is not invertible if 0 is an eigenvalue of A .
 - b) If v_1 and v_2 are linearly independent eigenvectors of A , then they must correspond to different eigenvalues.
 - c) The entries on the main diagonal of A are the eigenvalues of A .
 - d) The eigenvectors are in the range of the matrix $A - \lambda I$.
 - e) The number λ is an eigenvalue of A if and only if there is a nonzero solution to the equation $(A - \lambda I)x = 0$.
 - f) To find the eigenvectors of A , we reduce the matrix A to row echelon form.
3. Find a basis for the (-1) -eigenspace of the following matrices.

a) $A = \begin{pmatrix} 2 & 3 & 1 \\ 3 & 2 & 4 \\ 0 & 0 & -1 \end{pmatrix}$

b) $A = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$

4. In what follows, T is a linear transformation with matrix A . Find the eigenvectors and eigenvalues of A without doing any matrix calculations. (Draw a picture!)

a) $T =$ identity transformation of \mathbf{R}^3 .

b) $T =$ projection onto the xz -plane in \mathbf{R}^3 .

c) $T =$ counterclockwise rotation by $\pi/4$ in \mathbf{R}^2 .

d) $T =$ reflection over $y = 2x$ in \mathbf{R}^2 .