Linear Algebra Homework #5

Replace this text with your name

Due: Replace this text with a due date

Exercise (5.1.11)**.** Find the characteristic equation, the eigenvalues, and bases for the eigenspaces of the matrix.

$$\begin{bmatrix} 4 & 0 & -1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{bmatrix}$$

Solution: Replace this text with your solution. □

Exercise (5.1.15)**.** Find the eigenvalues and a basis for each eigenspace of the linear operator defined by $T(x, y) = (x + 4y, 2x + 3y)$. [Suggestion: Work with the standard matrix for the operator.]

Solution: Replace this text with your solution. □

Exercise (5.1.21)**.** In each part, find the eigenvalues and the corresponding eigenspaces of the stated matrix operator on R^3. Use geometric reasoning to find the answers. No computations are needed.

(a) Reflection about the xy-plane.

(b) Orthogonal projection onto the xz-plane.

(c) Counterclockwise rotation about the positive x-axis through an angle of $90°$.

(d) Contraction with factor k ($0 \leq k < 1$).

Solution: Replace this text with your solution. □

Exercise (5.2.13)**.** Find the geometric and algebraic multiplicity of each eigenvalue of the matrix

$$A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 3 & 0 & 1 \end{bmatrix},$$

and determine whether A is diagonalizable. If A is diagonalizable, then find a matrix P that diagonalizes A, and find $P^{-1}AP$.

Solution: Replace this text with your solution. □

Exercise (5.2.19)**.** Let

$$A = \begin{bmatrix} -1 & 7 & -1 \\ 0 & 1 & 0 \\ 0 & 15 & -2 \end{bmatrix} \quad \text{and } P = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 5 \end{bmatrix}.$$

Confirm that P diagonalizes A, and then compute A^{11}.

Solution: Replace this text with your solution. □

Exercise (5.2.33)**.** Find the standard matrix A for the linear operator $T(x_1, x_2, x_3) = (3x_1, x_2, x_1 - x_2)$, and determine whether that matrix is diagonalizable. If diagonalizable, find a matrix P that diagonalizes A.

Solution: Replace this text with your solution. □