

Linear. Final Review.

Also study all the quizzes, the two previous tests, the reviews for those tests, and homework problems!

(1) Consider the following matrices:

$$A = \begin{bmatrix} 3 & 0 & 1 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & -1 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

Find the eigenvalues and eigenspaces for each of these. Are either diagonalizable? If so, find the matrix P , and check the similarity relationship, where the diagonal matrix D is related to the original by multiplying by P and P^{-1} .

² (2) Consider the two bases for \mathcal{P}_3 :

$$\mathcal{E} = \{1, x, x^2, x^3\}, \mathcal{C} = \{x^3 + 3x^2 + 1, x^2 - 2, x - 7, 2\}$$

Find the eigenvalues of $T(f) = f'' + xf''$.

$$[T]_{\mathcal{E}}^{\mathcal{E}} =$$

Is T diagonalizable? If so, find P .

If you found $[T]_{\mathcal{C}}^{\mathcal{C}}$, what would its eigenvalues be?

(3) Example.

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Is $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 2 & -1 \end{bmatrix}$ diagonalizable? If so, find P and D such that $A = PDP^{-1}$.