MAT 022A STUDY QUESTIONS TO THINK ABOUT

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These are questions to think about. You can look in your notes or the book to find information. You are encouraged to work out examples of when the first concept relates to the second and when it does not relate to the second. There will not be "solutions" posted for these questions, but you are encouraged to discuss them with your study groups and you can ask questions in office hours.

(1) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and the determinant?
(2) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and the null space?
(3) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and the column space?
(4) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and the nullity?
(5) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and the rank?
(6) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and eigenvalues?
(7) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and eigenvectors?
(8) Is there (if so what is it) a relationship between invertibility of an $n \times n$ matrix A and diagonalizability?
(9) Is there (if so what is it) a relationship between symmetric matrices and diagonalizability?
(10) Is there (if so what is it) a relationship between symmetric matrices and eigenvalues?
(11) Is there (if so what is it) a relationship between symmetric matrices and eigenvectors?
(12) Is there (if so what is it) a relationship between orthogonal matrices and inverses?
(13) Is there (if so what is it) a relationship between orthogonal matrices and the null space?
(14) Is there (if so what is it) a relationship between orthogonal matrices and the column space?
(15) Is there (if so what is it) a relationship between orthogonal matrices and diagonalizability?
(16) Is there (if so what is it) a relationship between the null space and the column space of an $m \times n$ matrix?
(17) Is there (if so what is it) a relationship between the nullity and the rank of an $m \times n$ matrix?
(18) Is there (if so what is it) a relationship between the null space and the row space of an $m \times n$ matrix?
(19) Is there (if so what is it) a relationship between upper triangular matrices and the determinant?
(20) Is there (if so what is it) a relationship between upper triangular matrices and the rank?
(21) Is there (if so what is it) a relationship between upper triangular matrices and the null space?
(22) Is there (if so what is it) a relationship between the inverse and the transpose of a matrix?
(23) Is there (if so what is it) a relationship between whether there are n different eigenvalues for an $n \times n$ matrix A and diagonalizability?
(24) Is there (if so what is it) a relationship between whether there are n different eigenvalues for an $n \times n$ matrix A and the number of linearly independent eigenvectors?
(25) Is there (if so what is it) a relationship between whether there are n linearly independent eigenvectors for an $n \times n$ matrix A and diagonalizability?
(26) Is there (if so what is it) a relationship between whether a matrix is diagonalizable and whether there exists an invertible matrix X and a diagonal matrix D such that $X^{-1}AX = D$ and $A = XDX^{-1}$?

(27) Is there (if so what is it) a relationship between whether $\det(A - \lambda I) = 0$ has repeated roots and whether there are n different eigenvalues for an $n \times n$ matrix A?

(28) Is there (if so what is it) a relationship between whether $\det(A - \lambda I) = 0$ has repeated roots and whether there are n linearly independent eigenvectors for an $n \times n$ matrix A?

(29) Is there (if so what is it) a relationship between whether $\det(A - \lambda I) = 0$ has repeated roots and diagonalizability?

(30) Is there (if so what is it) a relationship between ... (pick your own two linear algebra concepts)