2010 Matematik 2A hold 4 : Lay5SuppITF

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2010 Matematik 2A hold 4, Lay5SuppITF
Rasmus Veiergang Prentow, 5/31/10 at 12:47 PM

Question 1: *Score 0/1*

If A is invertible and 1 is an eigenvalue of A, then 1 is also an eigenvalue of A^{-1}.

INCORRECT

Your Answer:
Correct Answer: True

Question 2: *Score 0/1*

If A is row equivalent to the identity matrix I, then A is diagonalizable.

INCORRECT

Your Answer:
Correct Answer: False

Question 3: *Score 0/1*

If A contains a row or a column of zeroes, then 0 is an eigenvalue of A.

INCORRECT

Your Answer:
Correct Answer: True
Comment: True, since in either case $\det(A-\lambda I)$ has a factor $(-\lambda)$.

Question 4: *Score 0/1*

Each eigenvalue of A is also an eigenvalue of A^2.

INCORRECT

Your Answer:
Correct Answer: False
Comment: If λ is an eigenvalue of A, then λ^2 is an eigenvalue of A^2.

Question 5: *Score 0/1*

Each eigenvector of A is also an eigenvector of A^2.

INCORRECT

Your Answer:
Correct Answer: True

Question 6: *Score 0/1*

Each eigenvector of an invertible matrix A is also an eigenvector of A^{-1}.

INCORRECT

Your Answer:
Correct Answer: True

Question 7: *Score 0/1*

Eigenvalues must be nonzero scalars. INCORRECT

Your Answer:
Correct Answer: False

Question 8: *Score 0/1*

Eigenvectors must be nonzero vectors. INCORRECT

Your Answer:
Correct Answer: True

Question 9: *Score 0/1*

Two eigenvectors corresponding to the same eigenvalue are always linearly dependent. INCORRECT

Your Answer:
Correct Answer: False

Question 10: *Score 0/1*

Similar matrices always have exactly the same eigenvalues. INCORRECT

Your Answer:
Correct Answer: True

Question 11: *Score 0/1*

Similar matrices always have exactly the same eigenvectors. INCORRECT

Your Answer:
Correct Answer: False

Question 12: *Score 0/1*

The sum of two eigenvectors of a matrix A is also an eigenvector. INCORRECT

Your Answer:
Correct Answer: False
Comment: False, since the sum can be the zero vector.

Question 13: *Score 0/1*

The eigenvalues of an upper triangular matrix A are exactly the nonzero entries on the diagonal of A. INCORRECT

Your Answer:
Correct Answer: False
Comment: False, since all entries on the diagonal are eigenvalues of S.

Question 14: *Score 0/1*

The matrices A and A^T have the same eigenvalues, counting multiplicities. INCORRECT

Your Answer:
Correct Answer: True

Question 15: *Score 0/1*

If a 5×5 matrix has fewer than 5 distinct eigenvalues, then A is not diagonalizable.

INCORRECT

Your Answer:
Correct Answer: False

Comment:
False. For example the identity matrix has only one eigenvalue, namely 1, but is diagonalizable, since it is diagonal.

Question 16: *Score 0/1*

If A is diagonalizable, then the columns of A are linearly independent.

INCORRECT

Your Answer:
Correct Answer: False

Comment:
False. For example the matrix $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ has the two different eigenvalues 0 and 2, and is thus diagonalizable. But its columns are obviously linearly dependent.

Question 17: *Score 0/1*

A nonzero vector cannot correspond to two different eigenvalues of A.

INCORRECT

Your Answer:
Correct Answer: True

Question 18: *Score 0/1*

If A is similar to a diagonalizable matrix B, then A is also diagonalizable.

INCORRECT

Your Answer:
Correct Answer: True

Comment:
If $A = UBU^{-1}$ and $B = PDP^{-1}$, then $A = (UP)D(UP)^{-1}$, thus diagonalizable.

Question 19: *Score 0/1*

An $n \times n$ matrix with n linearly independent eigenvectors is invertible.

INCORRECT

Your Answer:
Correct Answer: False

Comment:
False. The zero matrix has n linearly independent eigenvectors, namely any basis for $\mathbf{R}^n$, but is obviously not invertible.

Question 20: *Score 0/1*

If A is an $n \times n$ diagonalizable matrix, then each vector in $\mathbf{R}^n$ can be written as a linear combination of eigenvectors of A.

INCORRECT

Your Answer:
Correct Answer: True

Comment:
True, since then we have a basis for $\mathbf{R}^n$ consisting of eigenvectors of A.
