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Question

Correct

Mark 1.00 out of 1.00

Flag question

Let $A = \begin{bmatrix} 1 & 2 & 5 & 0 & 5 \\ 0 & 0 & c & 2 & 2 \\ 0 & 0 & 0 & d & 2 \end{bmatrix}$

For what values of c and d , the matrix A has rank 2?

a. c = any value, d = 2

b. c = 0, d = 0

c. c = 0, d = -2

d. c = 0, d = 2

The correct answer is:

c = 0, d = 2

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Question **2**

Incorrect

Mark 0.00 out of 1.00

Flag question

Which of the following is false?

a. If the matrix P and Q are orthogonal, then PQ may not be orthogonal.

b. If the matrix P and Q are orthogonal, then PQ is orthogonal.

c. If P is an orthogonal matrix then P^{-1} is orthogonal.

d. If P is an orthogonal matrix then P^T is orthogonal. ✖

The correct answer is:

If the matrix P and Q are orthogonal, then PQ may not be orthogonal.

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Question **3**

Partially correct

Mark 0.50 out of 1.00

Flag question

Let $v_1, v_2, v_3 \in \mathbb{R}^4$. Define a function $f : \mathbb{R}^4 \to \mathbb{R}$ as $f(v) = det([v_1\ v_2\ v_3\ v])$ here vectors are written as columns of the matrix.

- [ ] a. f is a linear transformation
- [ ] b. f is bijective
- [x] c. f is surjective, if $v_1, \ldots, v_3$ are linearly independent. ✔
- [ ] d. f is injective/one to one

The correct answers are: f is a linear transformation,
f is surjective, if $v_1, \ldots, v_3$ are linearly independent.

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Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

For which real numbers λ are the following vectors linearly dependent in $\mathbb{R}^3$.

$$v_1 = \begin{bmatrix} \lambda \\ -1 \\ -1 \end{bmatrix}, v_2 = \begin{bmatrix} -1 \\ \lambda \\ -1 \end{bmatrix}, v_3 = \begin{bmatrix} -1 \\ -1 \\ \lambda \end{bmatrix}$$

a. $\lambda_1 = 0$ and $\lambda_2 = -1$

b. None of the options

c. $\lambda_1 = 2$ and $\lambda_2 = -1$ ✓

d. $\lambda_1 = -2$ and $\lambda_2 = 1$

The correct answer is:

$\lambda_1 = 2$ and $\lambda_2 = -1$

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Question **5**

Incorrect

Mark 0.00 out of 1.00

Flag question

Find the determinant of $A + B$ where A is 7×7 identity matrix and B is 7×7 matrix with all entries to be 7.

Answer: 32768 ✖

The correct answer is: 8

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Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

If H is 2-dimensional subspace of a 5-dimensional vector space V then

- a. H is the only 2 dimensional subspace of V
- b. H is isomorphic to $\mathbb{R}^2$. ✓
- c. For any $u \notin H$, $\dim(u + H) = 2$, where $u + H := \{u + h | h \in H\}$.

The correct answer is:
H is isomorphic to $\mathbb{R}^2$.

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Question **7**

Incorrect

Mark 0.00 out of 1.00

Flag question

What can you say about SVD decomposition of $A = \begin{bmatrix} i & i & 3 \\ i & 4 & 5 \\ 3 & 5 & 6i \end{bmatrix}$ as $U\Sigma V^T$, where i is the last digit of your student id?

a. $U \neq V$ ✗

b. $U = V^T$

c. U^2 and V^2 are same.

The correct answer is:
U^2 and V^2 are same.

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Question **8**

Correct

Mark 1.00 out of 1.00

Flag question

Let $A_{3\times4}$ be a matrix such that A^TA is of rank 3. Then

a. rank(A)=2

b. rank(A)=1

c. rank(A)=3 ✓

d. rank(A)=4

The correct answer is:
rank(A)=3

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Question **9**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let T be a linear map on R^3 and $T(e_1) = e_3, T(e_2) = e_1, T(e_3) = e_2$, where $e_1 = (1,0,0), e_2 = (0,1,0), e_3 = (0,0,1)$. Then

a. $T^3 = T^{-1}$

b. None of the options are correct.

c. $T = T^{-1}$ ✗

d. $T^2 = T^{-1}$

The correct answer is:

$T^2 = T^{-1}$

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Question **10**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let $A = \begin{bmatrix} 1 & 0 & 0 \\ i & (-1+i\sqrt{3})/2 & 0 \\ 0 & 1+2i & (-1-i\sqrt{3})/2 \end{bmatrix}$.

Then the trace of A^{102} is

a. 102

b. 100 ✖

c. 0

d. 1

The correct answer is:
0

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Question **11**

Correct

Mark 1.00 out of 1.00

Flag question

If the system $Ax = b$ (let $A_{6\times 10}$ matrix) has solution for every b, then $Col\ (A)$ is

a. $\mathbb{R}_{10}$

b. $\mathbb{R}_6$ ✓

c. $\mathbb{R}_4$

d. $\mathbb{R}_{16}$

The correct answer is:

$\mathbb{R}_6$

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67 ✓	68	69 ✓	70	71	72

Question **12**

Correct

Mark 1.00 out of 1.00

Flag question

The SVD of a matrix A = $\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$ is $U\Sigma V^T$, where $U = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \Sigma = \begin{bmatrix} a & 0 & 0 & 0 \\ 0 & \sqrt{2} & 0 & 0 \end{bmatrix}, V = \frac{1}{b}\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & -1 & 0 \\ 0 & c & 0 & -1 \end{bmatrix}$. Then the values of a,b,c are

a. None of the options are correct

b. $a = \sqrt{2},\ b = \sqrt{2},\ c = 1$ ✓

c. $a = -\sqrt{2},\ b = \sqrt{2},\ c = 1$

d. $a = \sqrt{2},\ b = -\sqrt{2},\ c = 1$

The correct answer is:

$a = \sqrt{2},\ b = \sqrt{2},\ c = 1$

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Question **13**

Partially correct

Mark 0.50 out of 1.00

Flag question

Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be a function such that T reflects each vector through the plane $Y = 1$. Choose correct statements from below.

- [x] a. T is onto. ✓
- [x] b. T is not bijective ✗
- [x] c. T is injective ✓
- [ ] d. T is not a linear transformation

The correct answers are:
T is injective,

T is onto.

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Question **14**

Incorrect

Mark 0.00 out of 1.00

Flag question

The matrix $< /p >< p > A =< /p >< p > \begin{bmatrix} < /p >< p > k & 5 \\ < /p >< p > 5 & -2 < /p >< p > \end{bmatrix} < /p >< p >$ is

a. negative definite for $k < \frac{-25}{2}$

b. positive definite for $k \geq \frac{25}{2}$ ✗

c. positive definite for $k \leq \frac{-25}{2}$

d. negative definite for $k < \frac{25}{2}$

The correct answer is:

negative definite for $k < \frac{-25}{2}$

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Question **15**

Correct

Mark 1.00 out of 1.00

Flag question

Solve following by Gauss-Siedel method

$$-a-b-2c+10d=-9$$
$$-2a+10b-c-d=15$$
$$10a-2b-c-d=3$$
$$-a-b+10c-2d=27$$

a. a = 2, b = 2, c = 8, d = -3

b. a = 1, b = 5, c = 7, d = -1

c. none of these

d. a = 2, b = 5, c = 3, d = 5

e. a = 1, b = 2, c = 3, d = 0 ✓

The correct answer is:
a = 1, b = 2, c = 3, d = 0

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e of the matrix

d. 4

The correct answer is:
3

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Question **16**

Correct

Mark 1.00 out of 1.00

Flag question

The dimension of the column space of the matrix

$$\begin{bmatrix} 2 & 4 & 1 & 3 & 8 \\ -1 & -2 & -1 & -1 & 1 \\ 2 & 4 & 0 & -3 & 4 \\ 2 & 4 & -1 & -7 & 4 \end{bmatrix}$$ is

- a. 2
- b. 3 ✓
- c. 1
- d. 4

The correct answer is:
3

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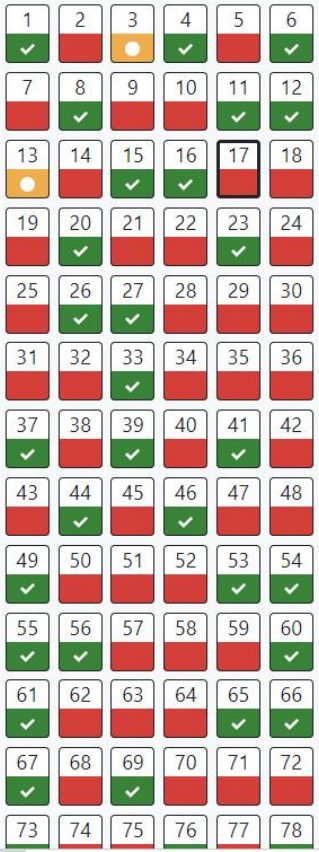

Question **17**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let $< /p >< p > A =< /p >< p >$ $\begin{bmatrix} < /p >< p > 2 & 5 & 0 & 0 & 0 \\ < /p >< p > 0 & 2 & 0 & 0 & 0 \\ < /p >< p > 0 & 0 & 4 & 2 & 0 \\ < /p >< p > 0 & 0 & 3 & 5 & 0 \\ < /p >< p > 0 & 0 & 0 & 0 & 7 < /p >< p > \end{bmatrix}$ $. < /p >< p >$

The characteristic polynomial of the matrix A is

a. $(t-2)^3(t-7)(t-14)$

b. $(t-2)^2(t-7)^2(t-14)$

c. $(t-2)^2(t-7)^3$

d. $(t-2)^3(t-7)^2$

The correct answer is:

$(t-2)^3(t-7)^2$

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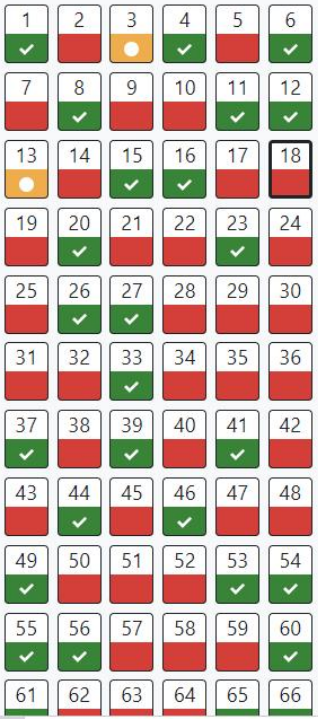

Question **18**

Incorrect

Mark 0.00 out of 1.00

Flag question

For what values of k, the matrix $< spanstyle =" font - size : 0.9375rem;" > A = \begin{bmatrix} -2 & -4 \\ -4 & k \end{bmatrix}$ is positive definite?

a. $k > 8$

b. $k \leq -8$

c. $k > -8$

d. There does not exist any k for which k is positive definite.

The correct answer is:
There does not exist any k for which k is positive definite.

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Question **19**

Incorrect

Mark 0.00 out of 1.00

Flag question

Any system of n linear equations in n variables has at most 1 solution.

- [x] a. Yes, if system is consistent. ✗
- [ ] b. False
- [x] c. True ✗

The correct answer is:
False

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Question **20**

Correct

Mark 1.00 out of 1.00

Flag question

Let $\{u_1, u_2 \ldots, u_5\}$ be an orthonormal set in $\mathbb{R}^5$. Define $A = \sum_{i=1}^{5} 5(i-1).\, u_i u_i^T$. Choose correct statement from below:

a. A is diagonalisable over $\mathbb{R}$ ✓

b. $A = [u_1\ u_2 \cdots u_5]$

c. A is invertible

The correct answer is:
A is diagonalisable over $\mathbb{R}$

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Question **21**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let $A_{n\times n}$ be a matrix with $\det(A) = 0$. Then which of the following always true?

a. dimension of $Col\ A = n$

b. dimension of $Col\ A \leq n$

c. dimension of $Col\ A < n$

d. dimension of $Col\ A = 0$ ✗

The correct answer is:
dimension of $Col\ A < n$

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Question **22**

Incorrect

Mark 0.00 out of 1.00

Flag question

If $A = \begin{bmatrix} a & b & 0 \\ b & c & 0 \\ 0 & 0 & -1 \end{bmatrix}$ with $a < 0$ and $ac = b^2$, then A is

- a. none of these ✖
- b. Negative definite
- c. Positive semidefinite
- d. Positive definite
- e. Negative semi-definite

The correct answer is:
Negative semi-definite

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Question **23**

Correct

Mark 1.00 out of 1.00

Flag question

For a symmetric matrix A, $Col(A^T)^{\perp} = Null(A^T)$

Select one:

- True ✔
- False

The correct answer is 'True'.

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Question **24**

Incorrect

Mark 0.00 out of 1.00

Flag question

The standard inner product of v and w on $\mathbb{R}^n$ is

a. $w^T . v^T$

b. none of these

c. wv^T and also commutative. ✖

d. $w^T v$

The correct answer is:
$w^T v$

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Question **25**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let A be a square matrix. Then

a. none of the these.

b. det(A) is a product of distinct eigenvalues of A.

c. det(A)=product of singular values of A.

d. |det(A)|=modulus of product of singular values of A.

The correct answer is:
none of the these.

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Question **26**

Correct

Mark 1.00 out of 1.00

Flag question

If $Ax = b$ has exactly one solution then $Ax = 0$ also has exactly one solution.

a. True ✓

b. False

The correct answer is:
True

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Question **27**

Correct

Mark 1.00 out of 1.00

Flag question

Is the set of all matrices of the form $\begin{pmatrix} <p><p>2a & b \\ <p><p>3a+b & 3b<p><p> \end{pmatrix}$, $a, b \in R$, a subspace of $M_{2\times 2}$, where $M_{2\times 2}$ is the vector space of all 2×2 real matrices?

Select one:

- True ✔
- False

The correct answer is 'True'.

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Question **28**

Incorrect

Mark 0.00 out of 1.00

Flag question

Singular values of $\begin{bmatrix} -4 & 0 & 0 \\ 1 & 9 & 0 \\ 2 & 1 & 16 \end{bmatrix}$ are

a. 16, 9, 4

b. 16, 9, -4

c. 4, 3, 2 ✖

d. 16.1848, 9.0284, 3.9419

The correct answer is:
16.1848, 9.0284, 3.9419

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Question **29**

Incorrect

Mark 0.00 out of 1.00

Flag question

The quadratic form $Q(X) = 3x_1^2 + 2x_2^2 + x_3^2 + 4x_1x_2 + 4x_2x_3$ is

- a. negative definite
- b. semidefinite ✖
- c. positive definite
- d. indefinite

The correct answer is:
indefinite

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Question **30**

Incorrect

Mark 0.00 out of 1.00

Flag question

If rows of a square matrix U are orthogonal then U is a orthogonal matrix.

Select one:

- True ✖
- False

The correct answer is 'False'.

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Question **31**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let the SVD of the matrix $A = \begin{bmatrix} 4 & 11 & 14 \\ 8 & 7 & -2 \end{bmatrix}$ is $U\Sigma V^T$, then V can be the matrix

a. $\frac{1}{3}\begin{bmatrix} 2 & -2 & 1 \\ 1 & -1 & 2 \\ 2 & 2 & 2 \end{bmatrix}$

b. $\frac{1}{3}\begin{bmatrix} 1 & -2 & 2 \\ 2 & -1 & -2 \\ 2 & 2 & 1 \end{bmatrix} < spanstyle =" font - size : 0.9375rem;">$

c. $\frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & -1 & -2 \\ -2 & 2 & 1 \end{bmatrix}$

d. $\frac{1}{\sqrt{5}} < /p > \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

The correct answer is:

$\frac{1}{3}\begin{bmatrix} 1 & -2 & 2 \\ 2 & -1 & -2 \\ 2 & 2 & 1 \end{bmatrix} < spanstyle =" font - size : 0.9375rem;">$

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Question **32**

Incorrect

Mark 0.00 out of 1.00

Flag question

The minimal polynomial $m(t)$ of the matrix

$$A = \begin{bmatrix} 2 & 2 & -5 \\ 3 & 7 & -15 \\ 1 & 2 & -4 \end{bmatrix}$$ is

a. $t^2 + 4t + 3$

b. $t - 3$ ✗

c. $t^3 - 5t^2 + 7t - 3$

d. $t^2 - 4t + 3$

The correct answer is:

$t^2 - 4t + 3$

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Question **33**

Correct

Mark 1.00 out of 1.00

Flag question

The orthogonal matrix P that diagonalize the matrix

$$< /p >< p > A =< /p >< p > \begin{bmatrix} < /p >< p > 7 & 3 \\ < /p >< p > 3 & -1 < /p >< p > \end{bmatrix} < /p >< p >$$

(that is $D = P^{-1}AP$) is

a. $\frac{1}{\sqrt{17}} \begin{bmatrix} < /p >< p > 4 & 1 \\ < /p >< p > 1 & -4 < /p >< p > \end{bmatrix}$

b. $\frac{1}{\sqrt{5}} \begin{bmatrix} < /p >< p > 2 & 1 \\ < /p >< p > 1 & -2 < /p >< p > \end{bmatrix}$

c. $\frac{1}{\sqrt{8}} \begin{bmatrix} < /p >< p > 2 & 2 \\ < /p >< p > 2 & -2 < /p >< p > \end{bmatrix}$

d. $\frac{1}{\sqrt{10}} \begin{bmatrix} < /p >< p > 3 & 1 \\ < /p >< p > 1 & -3 < /p >< p > \end{bmatrix}$ ✓

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Question **34**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let V be the vector space of all real valued functions f from $\mathbb{R}$ into $\mathbb{R}$. Which of the following set is a subspace of V?

a. None of the options

b. $S = \{f \in V : f(0) = f(1)\}$

c. $S = \{f \in V : f(x^2) = (f(x))^2\}$ ✗

d. $S = \{f \in V : f(-1) = f(1)\}$

The correct answer is:
$S = \{f \in V : f(0) = f(1)\}$

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Question **35**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let V be the set of all 10×10 real symmetric matrices with determinant zero.

a. V is a vector space of dimension 45 over $\mathbb{R}$

b. V is a vector space of dimension 54 over $\mathbb{R}$

c. V is not a vector space over $\mathbb{R}$

d. V is a vector space of dimension 55 over $\mathbb{R}$

e. V is a vector space of dimension 100 over $\mathbb{R}$ ✗

The correct answer is:
V is not a vector space over $\mathbb{R}$

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Question **36**

Incorrect

Mark 0.00 out of 1.00

Flag question

The only non trivial subspaces of $\mathbb{R}^3$ are

a. All polynomials or curves passing through origin.

b. All planes passing through origin ✖

c. All lines and planes passing through origin

d. 0, R and $\mathbb{R}^2$.

The correct answer is:
All lines and planes passing through origin

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Question **37**

Correct

Mark 1.00 out of 1.00

Flag question

Let A be a square matrix. If $Ax = b$ is consistent for all values of b then A is invertible.

Select one:

- True ✔
- False

The correct answer is 'True'.

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Question **38**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let $S = span\{(1, 3, -4)\}$. S is a subspace of $\mathbb{R}^3$. Then the dimension of orthogonal complement $S^{\perp}$ is

a. 4

b. 3

c. 1

d. 2

The correct answer is:
2

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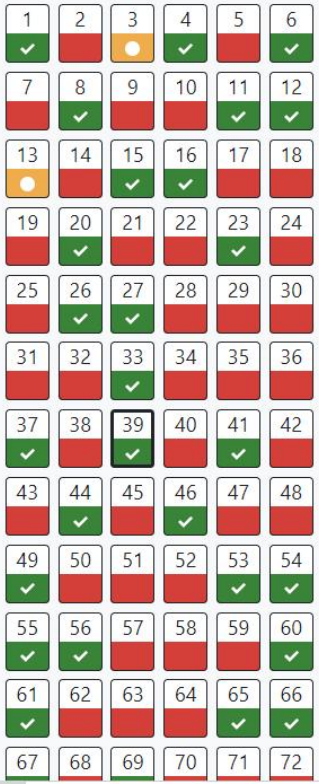

Question **39**

Correct

Mark 1.00 out of 1.00

Flag question

If SVD of a matrix $A = U\Sigma V^T$, then SVD of A^TA is

a. $U\Sigma^2U^T$

b. $V\Sigma^2V^T$ ✔

c. $V\Sigma^2U^T$

d. $UU^T\Sigma^2VV^T$

The correct answer is:

$V\Sigma^2V^T$

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Question **40**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let A be an $n \times n$ matrix and λ be an eigenvalue of A. Then

a. geometric multiplicity of λ= algebraic multiplicity of λ

b. algebraic multiplicity of $\lambda \leq$ geometric multiplicity of λ

c. geometric multiplicity of $\lambda \leq$ algebraic multiplicity of λ

d. geometric multiplicity has no such relation with algebraic multiplicity. ✖

The correct answer is:

geometric multiplicity of $\lambda \leq$ algebraic multiplicity of λ

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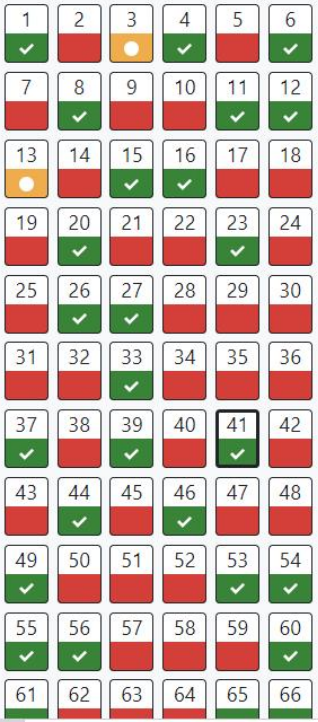

Question **41**

Correct

Mark 1.00 out of 1.00

Flag question

Let A be an $m \times n$ matrix and P be an orthogonal $m \times m$ matrix. Then which of the following is always true?

a. If A has a nonzero singular value a, then PA has singular value $-a^2$

b. If A has a nonzero singular value a, then PA has singular value -a

c. If A has a nonzero singular value a, then PA has singular value a ✓

d. If A has a nonzero singular value a, then PA has singular value 0

The correct answer is:

If A has a nonzero singular value a, then PA has singular value a

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Question **42**

Incorrect

Mark 0.00 out of 1.00

Flag question

Find the matrix representing the linear transformation L, where L is the rotation in R^2 counterclockwise by $90°$

a. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

b. $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ ✗

e. None of these

The correct answer is:

$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

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Question **43**

Incorrect

Mark 0.00 out of 1.00

Flag question

What is the maximum value of $8x^2 + 24xy - 24y^2$ on $\{(x, y) \in \mathbb{R}^2 | x^2 + y^2 = 1\}$?

a. 0

b. 14

c. None of these

d. -14

e. -28

f. 28

The correct answer is:
-28

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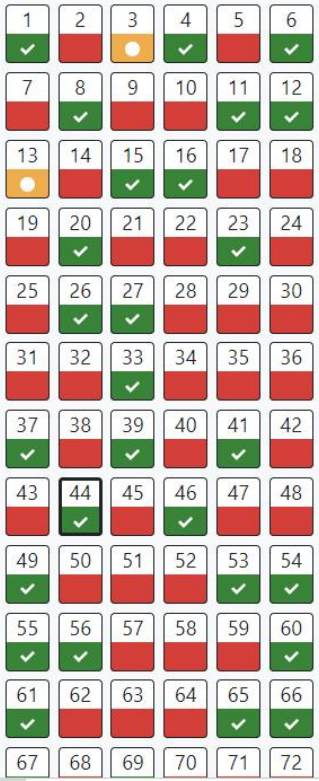

Question **44**

Correct

Mark 1.00 out of 1.00

Flag question

Let $\{v_1 = (1,1,1,1),\ v_2 = (1,2,4,5),\ v_3 = (1,-3,-4,-2)\}$ be a basis for a subspace S of R^4. Then by Gram-Schmidt process, an orthonormal basis is found. The obtained orthonormal basis for S is

a. None of the options are correct

b. $\{u_1 = \frac{1}{2}(1,1,1,1),\ u_2 = \frac{1}{\sqrt{20}}(3,1,-1,3),\ u_3 = \frac{1}{\sqrt{910}}(13,-14,16,-17)\}$

c. $\{u_1 = \frac{1}{2}(1,1,1,1),\ u_2 = \frac{1}{\sqrt{10}}(-2,-1,1,2),\ u_3 = \frac{1}{\sqrt{910}}(16,-17,-13,14)\}$ ✓

d. $\{u_1 = \frac{1}{2}(1,1,1,1),\ u_2 = \frac{1}{\sqrt{10}}(2,1,-1,-2),\ u_3 = \frac{1}{\sqrt{910}}(13,14,-16,-17)\}$

The correct answer is:

$\{u_1 = \frac{1}{2}(1,1,1,1),\ u_2 = \frac{1}{\sqrt{10}}(-2,-1,1,2),\ u_3 = \frac{1}{\sqrt{910}}(16,-17,-13,14)\}$

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Question **45**

Incorrect

Mark 0.00 out of 1.00

Flag question

A least square solution of

$$x_1 + 3x_2 = 5$$
$$x_1 - x_2 = 1$$
$$x_1 + x_2 = 0$$

is

a. $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

b. $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$

d. $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

e. none of these

The correct answer is: $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

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Question **46**

Correct

Mark 1.00 out of 1.00

Flag question

Let x, y be orthogonal vectors in an inner product space (V,<,>). Then u = 2x + 2y and v = -x + y

a. are orthogonal if and only if $||x|| = ||y|| = 1$

b. must be orthogonal

c. are orthogonal if and only if $||x|| = ||y||$ ✔

d. need not be orthogonal.

The correct answer is:
are orthogonal if and only if $||x|| = ||y||$

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Question **47**

Incorrect

Mark 0.00 out of 1.00

Flag question

The system of homogeneous linear equations

$$x_1 + 2x_2 + 3x_3 = 0$$
$$2x_1 - x_2 + x_3 = 0$$
$$3x_1 + x_2 + x_3 = 0$$
$$x_2 + 2x_3 = 0$$

has

a. only trivial solution

b. no solution

c. infinitely many solutions

d. finite number of non trivial solutions

The correct answer is:
only trivial solution

MA101 Endsem Online Part: Attemp

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Question **48**

Incorrect

Mark 0.00 out of 1.00

Flag question

Choose the correct statements from below

- [ ] a. Inverse of a symmetric matrix is also symmetric
- [x] b. An $n \times n$ symmetric matrix has n distinct eigenvalues ✗
- [x] c. Symmetric matrices have only real eigenvalues with eigenvectors corresponding to distinct eigenvalues orthogonal to each other. ✓
- [ ] d. There are symmetric matrices that are not orthogonally diagonalizable.

The correct answers are:
Symmetric matrices have only real eigenvalues with eigenvectors corresponding to distinct eigenvalues orthogonal to each other.,
Inverse of a symmetric matrix is also symmetric

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Question **49**

Correct

Mark 1.00 out of 1.00

Flag question

Let A be a 5×5 matrix with only eigenvalue -1. Then

- a. det(A)=1
- b. one can not compute the determinant using given information.
- c. det(A)=5
- d. det(A)=-5
- e. det(A)=-1 ✔

The correct answer is:
det(A)=-1

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Question **50**

Not answered

Marked out of 1.00

Flag question

Let $A_{n\times n}$ be an invertible matrix. Choose incorrect statement from below:

a. $Row(A) = \mathbb{R}^n$

b. $Col(A) = Row(A)$

c. A has n non zero singular values

d. $Null(A^T)^{\perp} = \{0\}$

The correct answer is:
$Null(A^T)^{\perp} = \{0\}$

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Question **51**

Not answered

Marked out of 1.00

Flag question

When are 3 vectors of $\mathbb{R}^3$ linearly independent?

Answer:

The correct answer is: If the matrix with columns as these vectors has rank 3

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Question **52**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let A be an invertible matrix. Then $\{x, y\}$ is an orthogonal set iff $\{Ax, Ay\}$ is also an orthogonal set.

- a. none of these
- b. true only if x and y are of norm 1.
- c. true only if x, y are non zero ✖
- d. true for all vectors x, y.

The correct answer is:
none of these

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Question **53**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the two statements:

(i) The matrix of a quadratic form is a symmetric matrix.

(ii) A quadratic form has no cross product terms if and only if the matrix of the quadratic form is a diagonal matrix.

Then

a. Statement (ii) is true but statement (i) is false.

b. Both the statements (i) and (ii) are false.

c. Both the statements (i) and (ii) are true. ✓

d. Statement (i) is true but statement (ii) is false.

The correct answer is:

Both the statements (i) and (ii) are true.

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Question **54**

Correct

Mark 1.00 out of 1.00

Flag question

If 5 is an eigenvalue of A, then ..... is an eigenvalue of $A^2 + 6I$.

a. -11

b. 31 ✓

c. 11

d. none of these

e. 19

The correct answer is:
31

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RAHUL RATHORE

Question **55**

Correct

Mark 1.00 out of 1.00

Flag question

Let $< /p >< p > A =< /p >< p > \begin{bmatrix} < /p >< p > -6 & 12 \\ < /p >< p > -3 & 6 < /p >< p > \end{bmatrix} < /p >< p >$ and $< /p >< p > w =< /p >< p > \begin{bmatrix} < /p >< p > 2 \\ < /p >< p > 1 < /p >< p > \end{bmatrix} < /p >< p >$. Then

a. $w \notin \mathrm{Nul}A$ and $w \in \mathrm{Col}A$

b. $w \in \mathrm{Nul}A$ and $w \notin \mathrm{Col}A$

c. $w \notin \mathrm{Nul}A$ and $w \notin \mathrm{Col}A$

d. $w \in \mathrm{Nul}A$ and $w \in \mathrm{Col}A$ ✓

The correct answer is:
$w \in \mathrm{Nul}A$ and $w \in \mathrm{Col}A$

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Question **56**

Correct

Mark 1.00 out of 1.00

Flag question

There is a line which passes through $\begin{bmatrix} -6 \\ 2 \\ -2 \end{bmatrix}, \begin{bmatrix} 12 \\ -4 \\ 4 \end{bmatrix}, \begin{bmatrix} -18 \\ 6 \\ -6 \end{bmatrix}$

Select one:

- True ✔
- False

The correct answer is 'True'.

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Question **57**

Incorrect

Mark 0.00 out of 1.00

Flag question

For an $m \times n$ matrix A in its echelon form, which of the following is false?

a. Number of pivot elements + number of free variables = m.

b. Number of pivot elements + number of free variables = n

c. Number of free variables is the dimension of the null space of A

d. Number of pivot elements is the dimension of the column space of A

The correct answer is:

Number of pivot elements + number of free variables = m.

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Question **58**

Incorrect

Mark 0.00 out of 1.00

Flag question

Elementary row operations on a matrix can change its column space.

Select one:

- True
- False ✗

The correct answer is 'True'.

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Question **59**

Incorrect

Mark 0.00 out of 1.00

Flag question

If we apply power method to $A = \begin{bmatrix} 5 & 2 \\ 2 & 2 \end{bmatrix}$ with $x_0 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ then it will converge to

a. none of these

b. $\begin{bmatrix} -0.8944 \\ -0.4472 \end{bmatrix}$

c. $\begin{bmatrix} 0.4472 \\ -0.8944 \end{bmatrix}$

d. $\begin{bmatrix} 1 \\ 0.5 \end{bmatrix}$

e. does not converge

The correct answer is:

$\begin{bmatrix} 1 \\ 0.5 \end{bmatrix}$

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RAHUL RATHORE

Question **60**

Correct

Mark 1.00 out of 1.00

Flag question

Find k so that $u = (1, 2, k, 3)$ and $v = (3, k, 7, -5)$ in $\mathbb{R}^4$ are orthogonal.

a. $\frac{4}{3}$ ✓

b. 0

c. $\frac{3}{4}$

d. 1

The correct answer is:

$\frac{4}{3}$

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Question **61**

Correct

Mark 1.00 out of 1.00

Flag question

Let A and B be symmetric matrices with positive eigenvalues then

- a. None of these
- b. eigenvalues of $A + B$ are also positive ✓
- c. A^2 & B^2 are positive definite. ✓
- d. eigenvalues of AB are also positive. ✗

The correct answers are:
A^2 & B^2 are positive definite.

,

eigenvalues of $A + B$ are also positive

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Question **62**

Incorrect

Mark 0.00 out of 1.00

Flag question

Consider the following two statements.

(i) The matrix A and A^T have same null space

(ii) The matrix A and A^T have same column space

a. Both statements are false

b. (i) is true but (ii) is false

c. Both statements are true ✗

d. (i) is false but (ii) is true

The correct answer is:
Both statements are false

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Question **63**

Not answered

Marked out of 1.00

Flag question

Which of the following systems of linear equations has a strictly diagonally dominant coefficient matrix?

a. $3x + 5y = 2$
$x + 3y = -4$

b. $9x - 3y = -12$
$6x + 15y = 6$

c. $8x + 4y = 4$
$4x - 28y = 16$

d. $4x = 2y - z - 1$
$x + z = -4$
$3x - 5y + z = 3$

The correct answers are:

$9x - 3y = -12$
$6x + 15y = 6$

,

$8x + 4y = 4$
$4x - 28y = 16$

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Question **64**

Incorrect

Mark 0.00 out of 1.00

Flag question

A least-squares solution of an inconsistent linear system $Ax = b$ is a vector x' such that

- a. none of these
- b. $||b - Ax'|| \leq ||b - Ax||$ for any vector x.
- c. $(A^T A)x' = A^T b$
- d. $||b - Ax|| \leq ||b - Ax'||$ for any vector x ✗
- e. $||b - Ax'|| = ||b - Ax||$ for any vector x.
- f. $||b - Ax'|| = 0$

The correct answers are:
$||b - Ax'|| \leq ||b - Ax||$ for any vector x.
,
$(A^T A)x' = A^T b$

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Question **65**

Correct

Mark 1.00 out of 1.00

Flag question

Consider the linear system of equations $AX = b$, where

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

and

$$b = \begin{pmatrix} 6 \\ 0 \\ 0 \end{pmatrix}$$

. Then one least square solution to the above problem is

a. $\begin{pmatrix} 4 \\ -1 \\ -1 \end{pmatrix}$

b. $\begin{pmatrix} 4 \\ -1 \\ 1 \end{pmatrix}$ ✓

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c. $\begin{pmatrix} < /p >< p > & 4 \\ < /p >< p > & -1 \\ < /p >< p > & 0 < /p >< p > \end{pmatrix}$

d. $\begin{pmatrix} < /p >< p > & 5 \\ < /p >< p > & 3 \\ < /p >< p > & 0 < /p >< p > \end{pmatrix}$

The correct answer is:

$$\begin{pmatrix} < br/ > & 4 \\ < br/ > & -1 \\ < br/ > & 1 < br/ > \end{pmatrix}$$

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Question **66**

Correct

Mark 1.00 out of 1.00

Flag question

Least square solution of the linear system $Ax = b$ for $A = \begin{bmatrix} 0 & 2 \\ 1 & 1 \\ 4 & 0 \\ 2 & 2 \end{bmatrix}, b = \begin{bmatrix} 0 \\ -11 \\ -2 \\ -22 \end{bmatrix}$ is

a. does not exists

b. $\begin{bmatrix} -1 \\ -2 \end{bmatrix}$ ✔

c. none of these

d. $\begin{bmatrix} -2 \\ -1 \end{bmatrix}$

The correct answer is:
$\begin{bmatrix} -1 \\ -2 \end{bmatrix}$

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Question **67**

Correct

Mark 1.00 out of 1.00

Flag question

Let V be the vector space of all 3×3 matrices with real entries. Then the dimension of V is

- a. 9 ✓
- b. 12
- c. 6
- d. 3

The correct answer is:
9

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Question **68**

Incorrect

Mark 0.00 out of 1.00

Flag question

When does Jacobi's method converge ?

- a. none of these
- b. For strictly diagonally dominant system of linear equations.
- c. for linear system with coefficient matrix as symmetric matrices
- d. For invertible coefficient matrix ✖

The correct answer is:
For strictly diagonally dominant system of linear equations.

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Question **69**

Correct

Mark 1.00 out of 1.00

Flag question

Let $T : R^2 \longrightarrow R^2$ be a linear map with $T(1,2) = (2,3)$ and $T(0,1) = (1,4)$. Then for any $(a,b) \in R^2$, $T(a,b)$ equals

a. (b, 5a - 4b)

b. (-b, 5a +4b)

c. (b, -5a + 4b) ✓

d. (3a, 7b)

The correct answer is:

(b, -5a + 4b)

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Question **70**

Incorrect

Mark 0.00 out of 1.00

Flag question

Consider the matrix $< /p >< p > A =< /p >< p >$ $\begin{pmatrix} < /p >< p > & 1 & 1 & 1 \\ < /p >< p > & 1 & 0 & 1 \\ < /p >< p > & 1 & 1 & 1 < /p >< p > \end{pmatrix}$ $< /p >< p >$. Then A is

- a. negative definite
- b. positive definie
- c. positive semidefinite ✗
- d. indefinite

The correct answer is:
indefinite

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Question **71**

Not answered

Marked out of 1.00

Flag question

If $\det \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} = 7$, then $\det \begin{bmatrix} a & b & c \\ 3d & 3e & 3f \\ 3g & 3h & 3i \end{bmatrix}$ is

Answer:

The correct answer is: 63

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Question **72**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let $T : R^3 \longrightarrow R^3$ be a linear transformation defined by $T(x, y, z) = (x + 2y - z,\ y + z,\ x + y - 2z)$. Let $ColT$ denotes the column space of T, and $NulT$ denotes the null space of T. Then

a. $dim(ColT) = 0$ and $dim(NulT) = 3$

b. $dim(ColT) = 1$ and $dim(NulT) = 2$

c. $dim(ColT) = 3$ and $dim(NulT) = 0$ ✖

d. $dim(ColT) = 2$ and $dim(NulT) = 1$

The correct answer is:

$dim(ColT) = 2$ and $dim(NulT) = 1$

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RAHUL RATHORE

Question **73**

Correct

Mark 1.00 out of 1.00

Flag question

Let A be a 2×2 matrix with determinant 1 and non-diagonal entries same.

a. 0 can be eigenvalue of A.

b. can not say anything about A.

c. eigenvalue of A is either 1 or -1 but not both. ✔

d. eigenvalues of A are 1, -1.

e. only eigenvalue of A is 1.

f. sum of all eigenvalues of A is 1.

The correct answer is:
eigenvalue of A is either 1 or -1 but not both.

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Question **74**

Incorrect

Mark 0.00 out of 1.00

Flag question

The set $B = \{(1, 0, -1), (1, 2, 1), (\frac{7}{2}, 6, \frac{3}{2})\}$ forms a basis of $\mathbb{R}^3$?

Select one:

- True ✗
- False

The correct answer is 'False'.

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Question **75**

Incorrect

Mark 0.00 out of 1.00

Flag question

The dimension of the null space of the matrix $A = \begin{pmatrix} <p><p>2 & 4 & 1 & 3 & 8 \\ <p><p>-1 & -2 & -1 & -1 & 1 \\ <p><p>2 & 4 & 0 & -3 & 4 \\ <p><p>2 & 4 & -1 & -7 & 4<p><p> \end{pmatrix}$ is

- a. 1
- b. 3
- c. 4 ✗
- d. 2

The correct answer is:
2

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Question **76**

Correct

Mark 1.00 out of 1.00

Flag question

DAD^{-1} has complex eigenvalue iff A has complex eigenvalue.

Select one:

- True ✔
- False

The correct answer is 'True'.

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Question **77**

Incorrect

Mark 0.00 out of 1.00

Flag question

Let A and B be similar matrices. Then which of the following is not always true?

a. A and B have same eigenvalues

b. trace (A) = trace (B) (trace means sum of main diagonal elements)

c. A and B have same eigenvectors with respect to an eigenvalue λ

d. det(A) = det(B)

The correct answer is:
A and B have same eigenvectors with respect to an eigenvalue λ

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Question **78**

Correct

Mark 1.00 out of 1.00

Flag question

Consider a block partitioned matrix $P = \begin{bmatrix} I & 0 \\ A & I \end{bmatrix}$. Then

- a. invertibility of P depends on A.
- b. P is always invertible. ✔
- c. If P is invertible then A=0.

The correct answer is:
P is always invertible.

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Question **79**

Not answered

Marked out of 1.00

Flag question

QR method for $\begin{bmatrix} 2 & 2 \\ 5 & 2 \end{bmatrix}$ converges to

a. $\begin{bmatrix} 1 & 0 \\ 0 & 6 \end{bmatrix}$

b. $\begin{bmatrix} 6 & 0 \\ 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 0.4472 & -0.8944 \\ -0.8944 & -0.4472 \end{bmatrix}$

The correct answer is:

$\begin{bmatrix} 6 & 0 \\ 0 & 1 \end{bmatrix}$

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Question **80**

Not answered

Marked out of 1.00

Flag question

If σ is a singular value of A then σ^2 is a singular value of A^2

a. True

b. False

The correct answer is:
False

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