



Mathematics MCQ (extract)

Duration: 1 hour

Scoring scale: 2 for a correct answer, 0 if no answer is given, -1 for a wrong answer

Notations

\mathbb{R} is the set of real numbers, \mathbb{C} is the set of complex numbers.

For $a, b \in \mathbb{R}$,

- $[a, b] = \{x \in \mathbb{R} : a \leq x \leq b\}$, $]a, b[= \{x \in \mathbb{R} : a < x < b\}$,
- $[a, b) = \{x \in \mathbb{R} : a \leq x < b\}$, $(a, b] = \{x \in \mathbb{R} : a < x \leq b\}$,
- $\mathcal{M}_n(\mathbb{K})$ is the set of square matrices of order n on the field \mathbb{K} .

Question 1

\mathbb{R} is countable.

- A True
 B False

Question 2

Recall that \subsetneq denotes: "subset of and not equal to". Let E be a set, A a subset of E and $(B_i)_{i \in I}$ a collection of subsets of E , indexed by an unspecified set I . Then

- A $A \cap (\bigcup_{i \in I} B_i) \subsetneq \bigcup_{i \in I} (A \cap B_i)$
 B $\bigcup_{i \in I} (A \cap B_i) \subsetneq A \cap (\bigcup_{i \in I} B_i)$
 C $A \cap (\bigcup_{i \in I} B_i) = \bigcup_{i \in I} (A \cap B_i)$

Question 3

Let $\rho : x \in \mathbb{R} \mapsto \begin{cases} \exp(-1/x^2) & \text{if } x \neq 0, \\ 0 & \text{otherwise.} \end{cases}$

Then $\rho \in C^\infty(\mathbb{R})$.

- A False
 B True

Question 4

Let A be a matrix in $\mathcal{M}_5(\mathbb{R})$. For all $B, C \in \mathcal{M}_5(\mathbb{R})$, we have $(AB = AC) \Rightarrow (B = C)$.

- A True
 B False

Question 5

Let $(u_n)_{n \in \mathbb{N}}$ be a real sequence. Which of the following statements are true?

- A If $\frac{u_{n+1}}{u_n} \rightarrow 1$ then $(u_n)_{n \in \mathbb{N}}$ converges
- B If $u_{n+1} - u_n$ converges to 0 then $(u_n)_{n \in \mathbb{N}}$ converges
- C If $\frac{u_n}{1 + u_n^2} \rightarrow 0$ then u_n converges to 0, as $n \rightarrow \infty$
- D The sequence $(v_n)_{n \in \mathbb{N}}$ defined by $v_n = \frac{u_n}{1 + u_n^4}$ is bounded
- E If $\lim_{n \rightarrow \infty} u_n = \ell$ then $u_{n+1} - u_n$ converges to 0, as $n \rightarrow \infty$

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0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

← Encode your inscription number on the left of this box, and write your name and first name under this box.

Name and first name:

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Answers must be given exclusively on this sheet: answers given on the other sheets will be ignored.

WARNING: the boxes must be completely filled, not checked, otherwise your answers might not be taken into account.

Question 1 : A B

Question 4 : A B

Question 2 : A B C

Question 5 : A B C D E

Question 3 : A B