

i

1

If f is differentiable at the point x_0 , then it is also continuous at the point x_0 .
Select one alternative:

☐ True

☐ False

Maximum marks: 1

2

The number $\sqrt{2}$ is rational.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

3

Let $f : (0, +\infty) \rightarrow \mathbb{R}$, $f(x) = \frac{1}{x}$ and $g : (0, +\infty) \rightarrow \mathbb{R}$, $g(x) = \ln x$. The domain of $f \circ g$ is $(0, 1) \cup (1, \infty)$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

4

The limit of a sequence $(x_n)_{n=1}^\infty \subseteq \mathbb{R}$, if it exists, is unique.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

5

If the graph of f has a tangent line at the point $(x_0, f(x_0))$, then f is differentiable at x_0 .
Select one alternative:

☐ True

☐ False

Maximum marks: 1

6

Every sequence $(x_n)_{n=1}^\infty \subseteq \mathbb{R}$ has a convergent subsequence.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

7

The tangent line of the graph of $f(x) = e^x$ at the point $(0, 1)$ has equation $y = x + 1$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

8

$\arcsin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

9

The set \mathbb{Z} of integers is bounded.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

- 10 $\cosh 0 = 1.$
Select one alternative:

☐ True

☐ False

Maximum marks: 1

- 11 If $\lim_{n \rightarrow \infty} a_n = +\infty$, then $\lim_{n \rightarrow \infty} \frac{1}{a_n} = 0.$
Select one alternative:

☐ True

☐ False

Maximum marks: 1

- 12 If $f : \mathbb{R} \rightarrow \mathbb{R}$ is continuous, then it has a maximum and a minimum value.
Select an alternative

☐ True

☐ False

Maximum marks: 1

- 13 If $f : A \rightarrow \mathbb{R}$ is continuous on some point $x_0 \in A$, then $\lim_{x \rightarrow x_0} f(x) = f(x_0).$
Select one alternative:

☐ True

☐ False

Maximum marks: 1

- 14 If the sequence $(x_n)_{n=1}^\infty \subseteq \mathbb{R}$ does not converge, then it is not bounded.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

15

If $f : (a, b) \rightarrow \mathbb{R}$ is differentiable and strictly increasing on (a, b) , then $f'(x) > 0$ for all $x \in (a, b)$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

16

$\lim_{n \rightarrow \infty} n^{-1/n} = 1$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

17

If $f : [a, b] \rightarrow \mathbb{R}$ is continuous, then $f([a, b]) = [c, d]$ for some $c, d \in \mathbb{R}$ with $c \leq d$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

18

Let $(y_n)_{n=1}^\infty$ be a subsequence of a sequence $(x_n)_{n=1}^\infty$. If $(x_n)_{n=1}^\infty$ is bounded, then $(y_n)_{n=1}^\infty$ is also bounded.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

19

If $f : \mathbb{R} \rightarrow \mathbb{R}$ is a polynomial of degree 7, then $f(\mathbb{R}) = \mathbb{R}$.
Select one alternative:

☐ True

☐ False

Maximum marks: 1

20 If $\lim_{x \rightarrow +\infty} f(x) = +\infty$ and $\lim_{x \rightarrow +\infty} g(x) = +\infty$ then $\lim_{x \rightarrow +\infty} (f(x) - g(x))$ must be finite.

Select one alternative:

- ☐ True
- ☐ False

Maximum marks: 1

21 Find $\lim_{x \rightarrow 1} \frac{1}{x^4 - 1}$.

Select one alternative:

- ☐ 0
- ☐ $-\infty$
- ☐ It does not exist.
- ☐ $+\infty$

Maximum marks: 1

22 Find $\lim_{x \rightarrow 0^-} \left(\frac{1}{\tan x} - \frac{1}{x} \right)$.

Select one alternative:

- ☐ $+\infty$
- ☐ 1
- ☐ 0
- ☐ $-\infty$

Maximum marks: 1

23

Find $\lim_{x \rightarrow +\infty} \frac{\sin x}{x}$.

Select one alternative:

☐ $+\infty$

☐ It does not exist.

☐ 1

☐ 0

Maximum marks: 1

24

Find $\lim_{x \rightarrow 0^+} \frac{\tan x}{\ln(1+x)}$.

Select one alternative:

☐ 1

☐ 0

☐ $+\infty$

☐ $-\infty$

Maximum marks: 1

25

Find $\lim_{n \rightarrow \infty} \sqrt[n]{n2^n}$.

Select one alternative:

☐ 2

☐ $+\infty$

☐ 0

☐ 1

Maximum marks: 1

26 Find $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$.

Select one alternative:

- ☐ e
- ☐ $+\infty$
- ☐ 1
- ☐ 0

Maximum marks: 1

27 The tangent line of the graph of $f(x) = xe^{x^2}$ at the point $(1, f(1))$ has equation

Select one alternative:

- ☐ $y = x$
- ☐ $y = 0$
- ☐ $y = ex + 1$
- ☐ $y = 3ex - 2e$

Maximum marks: 1

28 The normal line of the graph of $g(x) = \frac{\ln x}{x}$ at the point $(e, g(e))$ has equation

Select one alternative:

- ☐ $y = 0$
- ☐ $y = ex$
- ☐ $y = x + 1$
- ☐ $x = e$

Maximum marks: 1

29 Let $f, g : \mathbb{R} \rightarrow \mathbb{R}$ be differentiable. If $f(0) = g(0) = 1, f'(0) = 2, g'(0) = -1$ then $(fg)'(0)$ is

Select one alternative:

- ☐ 3
- ☐ It might not exist
- ☐ 1
- ☐ 0

Maximum marks: 1

30 Let $f, g : \mathbb{R} \rightarrow \mathbb{R}$ be differentiable with $g(\mathbb{R}) = \mathbb{R}$. If $f(0) = f(1) = 1, g(1) = g'(1) = 2$ and $x_0 = 0$ is a critical point of f , then $(g \circ f)'(0)$ is equal to

Select one alternative:

- ☐ 0
- ☐ 3
- ☐ 2
- ☐ 1

Maximum marks: 1

31 Let $f(x) = \begin{cases} ax + 1, & x \leq 0 \\ e^x, & x > 0. \end{cases}$ If f is differentiable in \mathbb{R} , then

Select one alternative:

- ☐ $a = e$
- ☐ $a = -1$
- ☐ $a = 0$
- ☐ $a = 1$

Maximum marks: 1

32 Let $f(x) = \begin{cases} bx^2, & x \leq 0 \\ cx + b \ln x, & x > 0. \end{cases}$ If f is differentiable at $x_0 = 0$, then

Select one alternative:

- ☐ $b = 0$ and $c = 1$
- ☐ $b = c$
- ☐ $b = c + 1$
- ☐ $b = c - 1$

Maximum marks: 1

33 Find $\lim_{x \rightarrow 0^+} \sqrt{x} \sin\left(\frac{1}{\sqrt{x}}\right)$.

Select one alternative:

- ☐ It does not exist
- ☐ 0
- ☐ 1
- ☐ $+\infty$

Maximum marks: 1

34 Find $(\arctan x^2)'$.

Select one alternative:

- ☐ $\frac{1}{1+x^4}$
- ☐ $\frac{2x}{1+x^2}$
- ☐ $\frac{2x}{1+x^4}$
- ☐ $\frac{1}{(\cos x^2)^2}$

Maximum marks: 1

35 Find the critical points of $f(x) = xe^x$.

Select one alternative:

- ☐ -1
- ☐ It does not have any critical points.
- ☐ 1 and -1
- ☐ 0

Maximum marks: 1

36 Which of the following functions is not monotonic in its domain of definition?

Select one alternative:

- ☐ $f_4(x) = \arcsin x$
- ☐ $f_2(x) = \cot x$
- ☐ $f_3(x) = \sinh x$
- ☐ $f_1(x) = \arctan x$

Maximum marks: 1

37 Find the inflection points of $f(x) = x^4 - 2x + 1$.

Select one alternative:

- ☐ $1/\sqrt[3]{2}$ and $-1/\sqrt[3]{2}$
- ☐ 0
- ☐ 1
- ☐ It does not have any inflection points

Maximum marks: 1

38 Find $(\cosh x)'$.
Select one alternative:

- ☐ $\sin x$
- ☐ $-\sinh x$
- ☐ $\tanh x$
- ☐ $\frac{1}{2}(e^x - e^{-x})$

Maximum marks: 1

39 What is the domain of the function $x \mapsto \arcsin x$?
Select one alternative:

- ☐ $[-\frac{\pi}{2}, \frac{\pi}{2}]$
- ☐ \mathbb{R}
- ☐ $[-\pi, \pi]$
- ☐ $[-1, 1]$

Maximum marks: 1

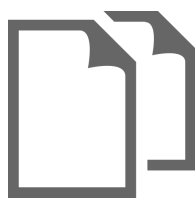
40 Find $\lim_{x \rightarrow 0} \frac{1}{\sin x}$.
Select one alternative:

- ☐ 0
- ☐ $-\infty$
- ☐ $+\infty$
- ☐ It does not exist.

Maximum marks: 1

Document 1

Attached



Department of Mathematics

Midterm test for MA1101 Basic Course in Analysis I

Test date: 5 October 2020

Test time (from-to): 19:00 – 20:30

Permitted Test Support Material: A / All support material is allowed

Academic contact during test: Agamemnon Zafeiropoulos

Phone: 984 69 69 9

OTHER INFORMATION:

Make your own assumptions: Only contact academic contact in case of errors or insufficiencies in the question set.

Saving: Answers written in Inspira Assessment are automatically saved every 15 seconds. If you are working in another program remember to save your answer regularly.

Cheating/Plagiarism: The test is an individual, independent work. Examination aids are permitted. All submitted answers will be subject to plagiarism control. [Read more about cheating and plagiarism here.](#)

Weighting: All questions count equally.

ABOUT SUBMISSION:

Your answer will be submitted automatically when the test time expires and the test closes, if you have answered at least one question. This will happen even if you do not click “Submit and return to dashboard” on the last page of the question set. You can reopen and edit your answer as long as the test is open. If no questions are answered by the time the test time expires, your answer will not be submitted.

Withdrawing from the test: If you become ill or wish to submit a blank test/withdraw from the test for another reason, go to the menu in the top right-hand corner and click “Submit blank”. This cannot be undone, even if the test is still open.

Accessing your answer post-submission: You will find your answer in Archive when the test time has expired.