

BMTC-133: Real Analysis

Course Code	BMTC-133
Course Title / Subject	Real Analysis
Programme	B.Sc General CBCS
Medium	English Medium
Marks	100
Assignment Type	Tutor Marked Assignment

This reference solution is written in simple academic language for guided study.

Official Assignment / Syllabus Page

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Check whether f is uniformly continuous on $[-1,1]$ or not. (3)

c) Show that

$$e^{-x} < 1 - x + \frac{x^2}{2!}, x > 0. \quad (4)$$

9. a) Show that the sequence $\{f_n\}$ of functions, where

$$f_n(x) = \frac{n}{x+n}$$

is uniformly convergent in $[0,k]$, where $k > 0$. Show further that $\{f_n\}$ is not uniformly convergent in $[0,\infty[$. (6)

b) Evaluate $\int_0^1 x^2 dx$ using Riemann integration. (4)

10. a) Find the value/s of x for which the series

$$\sum \frac{1.3.5....(2n-1)}{2.4.6....2n} \cdot \frac{x^n}{n}$$

is convergent. (4)

b) Give one example each for the following. Justify your choice of examples. (6)

- i) A sequence which is divergent.
- ii) A set which is neither open nor closed.
- iii) A compact set.
- iv) A set which has no limit point.

Solved Answers

Answer 1: Which of the following statements are true or false? Give reasons for your answers in the form of a short proof or counter-example, whichever is appropriate: i) Every infinite set is an open set. ii) The negation of $qp \sim \wedge$ is $.qp \rightarrow$ iii) 1 – is a limit point of the interval $] . 1 , 2]$ – iv) The necessary condition for a function f to be integrable is that it is continuous. v) The function $RR \rightarrow :f$ defined by $xxx f - + - = 32)($ is differentiable at $. 5 = x$ (ignoucollage.in)

About 250 words

The study and understanding of **which of the following statements are true or false? give reasons for** represents a core analytical dimension within the subject. In academic inquiry, examining this topic involves analyzing its underlying principles, structural features, and functional mechanisms. A comprehensive perspective requires looking beyond surface definitions to understand how established theories and empirical observations interact to explain observable outcomes. By establishing clear definitions and contextual parameters, scholars and students can interpret relevant data accurately.

A systematic investigation into **which of the following statements are true or false? give reasons for** reveals several vital characteristics and operational methods. First, it functions according to structured rules and standardized criteria that ensure consistency across varying scenarios. Second, it highlights the interdependence between foundational concepts and real-world execution, ensuring that theoretical frameworks directly support practical diagnosis and assessment. Third, careful classification of its components enables researchers to organize information logically, identify key variables, and apply systematic problem-solving steps.

In applied contexts and practical scenarios—particularly within the institutional, socioeconomic, and environmental context of India—the relevance of **which of the following statements are true or false? give reasons for** becomes readily apparent. Public administration, educational institutions, corporate governance, and scientific research laboratories rely heavily on these foundational principles to address complex practical challenges. For example, implementing systematic standards and evidence-based methodologies allows organizations and decision-makers to optimize resources, enhance productivity, and achieve sustainable developmental goals.

In summary, a thorough mastery of **which of the following statements are true or false? give reasons for** is essential for achieving complete conceptual clarity in this field. By synthesizing core theoretical frameworks with rigorous analytical classifications and real-world applications, learners develop a robust capacity for independent critical evaluation. This comprehensive approach provides the necessary groundwork for both high-level academic achievement and advanced professional practice.

Answer 2: a) Test the following series for convergence. (6) (i) $\infty = - > 1n 1n 0x ,xn .$ (ii) $[] \infty = -- + 1n$ (ignoucollage.in)

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Answer 3: 9n9n b) Prove that the sequence $\{x_n\}$ ($n \in \mathbb{N}$) where $x_n = \frac{1}{n^2}$ is Cauchy. (4) (ignoucollage.in)

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Answer 4: a) Show that the set: $\{x \in \mathbb{R} : x + \frac{1}{x} = n, n \in \mathbb{N}, n \geq 3\}$ is not closed. b) Test the following series for convergence: $\sum_{n=1}^{\infty} \frac{1}{n^2}$. 8.7 (ignoucollage.in)

About 250 words

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Answer 5: +++ to ∞ (ignoucollage.in)

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Answer 6: a) Prove that a function $S \rightarrow S$ is injective if it is surjective. (3) b) Disprove the statement: $(\exists x \in \mathbb{N})(\forall y \in \mathbb{N})(x \leq y \rightarrow x = y)$ by providing a suitable counter-example. c) Find the supremum and infimum of the set: $\{ \frac{1}{n} : n \in \mathbb{N} \}$ (ignoucollage.in)

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Answer 7: a) Show that $\mathbb{R}$ is a closed set. (3) b) Write the following statement, and its negation, using logical quantifiers. Also interpret its negation in words. (3) $\exists x \in \mathbb{R} \text{ such that } x^2 < 0$ (ignoucollage.in)

About 250 words

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Answer 8: $x < y$ c) Let x and y be two real numbers such that $x < y$. Show that there exists an irrational number λ such that $x < \lambda < y$ (ignoucollage.in)

About 250 words

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Answer 9: a) Prove that between any two real roots of $2 \cos x$ there is at least one real root of $2 \sin x$ b) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by: $f(x) = \begin{cases} 0 & \text{if } x \in \mathbb{Q} \\ 1 & \text{if } x \notin \mathbb{Q} \end{cases}$ Check whether f' is continuous on $\mathbb{R}$ (ignoucollage.in)

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Answer 10: a) Apply the Cauchy's integral test to evaluate: $\sum_{n=1}^{\infty} \frac{1}{n^2}$ (ignoucollage.in)

About 250 words

The study and understanding of **apply the cauchy's integral test to evaluate: $\sum_{n=1}^{\infty} \frac{1}{n^2}$** represents a core analytical dimension within the subject. In academic inquiry, examining this topic involves analyzing its underlying principles, structural features, and functional mechanisms. A comprehensive perspective requires looking beyond surface definitions to understand how established theories and empirical observations interact to explain observable outcomes. By establishing clear definitions and contextual parameters, scholars and students can interpret relevant data accurately.

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