

COURSE / ASSIGNMENT DETAILS

BMTC-131: Calculus

Course Code	BMTC-131
Course Title / Subject	Calculus
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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10. a) If $I_{m,n} = \int x^m (\log x)^n dx$, show that:

$$(m+1)I_{m,n} = x^{m+1}(\log x)^n - n I_{m,n-1}.$$

Hence find the value of $\int x^4 (\log x)^3 dx$. (6)

- b) Verify Lagrange's mean value theorem for the function f defined by $f(x) = 2x^2 - 7x - 10$ over $[2, 5]$. (4)

Solved Answers

Answer 1: Which of the following statements are true or false? Give reasons for your answer in the form of a short proof or a counter-example, whichever is appropriate. a) The set $\{x \in \mathbb{R} : x^2 = 2\}$ is an infinite set. b) The greatest integer function is continuous on $\mathbb{R}$. c) $\int_0^1 x e^{dx} dx = e - 1$. d) Every integrable function is monotonic. e) $\oplus$ defines a binary operation on $\mathbb{Q}$, the set of rational numbers. (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) Find the domain of the function f given by $f(x) = \frac{1}{x^2 + 1}$. b) The set $\mathbb{R}$ of real numbers with the usual addition $(+)$ and usual multiplication $(\cdot)$ is given. Define $(*)$ on $\mathbb{R}$ as: $a * b = a + b$. Is $(*)$ associative in $\mathbb{R}$? Is $(\cdot)$ distributive $(*)$ in $\mathbb{R}$? Check. (ignoucollage.in)

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**Answer 3: a) If $z = x + iy$, show that the point z describes a circle. Also draw this circle.
b) Express $\frac{1}{z^2 + 1}$ as a sum of partial fractions. (ignoucollage.in)**

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Answer 4: a) Find the least value of , $\sec x \cos bx$ where $0 < b < \pi$ b) Evaluate: $\frac{d}{dx} \cot x + \frac{d}{dx} \tan x$ c) For any two sets S and T, show that: $S \cap (T \cap S) = S \cap T$ TS $(S \cup T) \cap (S \cap T) = S \cap T$ Depict this situation in the Venn diagram. (2) (ignoucollage.in)

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Answer 5: a) Let f and g be two functions defined on R by: (ignoucollage.in)

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Answer 6: $x^8xx) x (f 23 + --- = \text{and } --\alpha - \neq + = 3x\text{when}, 3x\text{when}, 3x) x (f) x (g i)$ Find the value of α for which f is continuous at $. 3x - = ii)$ Find all the roots of $. 0) x (f = b)$ Find the area between the curve $32 x) x^4 (y = -$ and its asymptote parallel to y -axis. (ignoucollage.in)

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Answer 7: a) If the revenue function is given by $x, xx^{215} dx dR 2 - + =$ being the input, find the maximum revenue. Also find the revenue function R , if the initial revenue is 0. b) Trace the curve $), x^3 (x) 1x (y 22 - = +$ clearly stating all the properties used for tracing it. (ignoucollage.in)

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Answer 8: a) Find the length of the cycloid $(\cos 1(y), \sin(x\theta - \alpha = \theta - \theta\alpha =$ and show that the line $2\pi = \theta$ divides it in the ratio 1 : 3. b) Find the condition for the curves, $1by ax^{22} = +$ and $1ybx a^{22} = ' + '$ intersecting orthogonally. (ignoucollage.in)

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Answer 9: a) If , $x \sin y = 1$ then show that $\frac{dy}{dx} = -\frac{y}{x}$. (ignoucollage.in)

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Answer 10: --- Hence using Leibnitz's formula, find the value of $\frac{d}{dx} (x^2 \sin y)$. (6) b) Find the largest subset of R on which the function $f(x) = \sin x$ is continuous. (ignoucollage.in)

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