

BMTC-132: Differential Equations

Course Code	BMTC-132
Course Title / Subject	Differential Equations
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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- b) Show that for the function f given by: (7)

$$f(x, y) = \frac{xy}{x^2 + y^2}$$

$$\lim_{x \rightarrow 0} \lim_{y \rightarrow 0} f(x, y) = \lim_{y \rightarrow 0} \lim_{x \rightarrow 0} f(x, y) = 0$$

But $\lim_{(x, y) \rightarrow (0, 0)} f(x, y)$ does not exist.

5. a) Show that the following function f is differentiable at $(0, 0)$: (8)

$$f(x, y) = \begin{cases} \frac{x^2 y^2}{x^2 + y^2}, & \text{if } (x, y) \neq (0, 0) \\ 0, & \text{if } (x, y) = (0, 0) \end{cases}$$

- b) Find the complete solution of the equation $px + qy = pq$. (7)

6. a) Using Charpit's method, find the complete integral of the differential equation: (7)

$$p^2 x + q^2 y = z$$

- b) Find partial derivatives f_x and f_y for the function: (3)

$$f(x, y) = 5x^4 y^2 + 6x^2 y^3$$

at the point $(1, -1)$.

- c) State Euler's theorem for homogeneous functions and verify it for the function: (5)

$$u = \frac{x^3 + y^3}{x + y}$$

7. a) The population of a town grows at a rate proportional to the population at any time. Its initial population of 500 increases by 15% in 10 years. What will be the population in 30 years? (6)

- b) Show that the following function is not continuous at $(0, 0)$: (4)

$$f(x, y) = \begin{cases} y \sin \frac{1}{x} + x \sin \frac{1}{y}, & x \neq 0, y \neq 0 \\ 1, & \text{otherwise} \end{cases}$$

Solved Answers

Answer 1: a) Solve the differential equations: (8) $1y^2x^4 \frac{1yx^2}{dx} \frac{dx}{dy} - + + + = b$ Solve the simultaneous equations: (7) $yx \frac{dz}{dx} xz \frac{dy}{dz} zy \frac{dx}{dy} - = - = -$ (ignoucollage.in)

About 250 words

The study and understanding of **solve the differential equations: (8) $1y^2x^4 \frac{1yx^2}{dx} \frac{dx}{dy} - + + + = b$** 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 **solve the differential equations: (8) $1y^2x^4 \frac{1yx^2}{dx} \frac{dx}{dy} - + + + = b$** 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 **solve the differential equations: (8) $1y^2x^4 \frac{1yx^2}{dx} \frac{dx}{dy} - + + + = b$** 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.

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Answer 2: a) By using the method of variation of parameter, find the general solution of the differential equation: (8) $x \sec yy' = + ' b$ If : (7) (ignoucollage.in)

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Answer 3: $xy^2yz^3 + \sin x = \cos y = \tan z$ when $0 < x, y, z < \frac{\pi}{2}$ = by (i) chain rule and by (ii) the direct substitution. (ignoucollage.in)

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Answer 4: a) Verify that the differential equation: $0 \leq x, y, z \leq \frac{\pi}{2}$ is integrable and find its integral. b) Solve: $xy^2yz^3 + \sin x = \cos y = \tan z$ (ignoucollage.in)

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Answer 5: a) Find the general solution of the equation: $(8) 0u)yx(zu)xz(yu)zy(xzyx$ (ignoucollage.in)

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Answer 6: $\lim_{x \rightarrow 0} \frac{1}{x}$ b) Show that for the function f given by: $f(x) = \frac{1}{x}$ (ignoucollage.in)

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Answer 9: a) Using Charpit's method, find the complete integral of the differential equation: (7) z yqxp 22 = + b) Find partial derivatives xf and yf for the function: (3) 3224 yx6yx5) y , x (

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Answer 10: a) The population of a town grows at a rate proportional to the population at any time. Its initial population of 500 increases by 15% in 10 years. What will be the population in (ignoucollage.in)

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