

Calculus & Differential Equations Complete Guide - Part 1

Mathematics - Integrals & Applications

1. Overview and Core Theoretical Principles:

This study document contains essential concepts, derivations, formulas, and real-world examples. Students are advised to review the definitions and practice the sample problems provided below.

2. Key Formulae & Laws:

- Fundamental Law: $E = mc^2$ / Ohm's Law: $V = I * R$ / Newton's Second Law: $F = m * a$
- Conservation Law: Total energy and momentum in an isolated system remains constant.
- Integration / Differentiation: $d/dx(e^x) = e^x$; $\text{Integral}(1/x \, dx) = \ln|x| + C$

3. Sample Solved Question:

Problem: Calculate the net electrostatic force acting on a point charge in a uniform electric field.

Solution: By applying Coulomb's Law and vector superposition, $F_{\text{net}} = q * E_{\text{net}} = (1.6e-19 \, \text{C}) * (500 \, \text{N/C})$.

Final Result: Force = $8.0 \times 10^{-17} \, \text{N}$ along the field direction.

4. Examination Strategy & Tips:

- Always write step-by-step units alongside numerical calculations.
- Draw clean, labeled diagrams to earn maximum marks in subjective sections.
- Re-evaluate boundary conditions and verify significant figures before final submission.

Calculus & Differential Equations Complete Guide - Part 2

Mathematics - Integrals & Applications

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- Fundamental Law: $E = mc^2$ / Ohm's Law: $V = I * R$ / Newton's Second Law: $F = m * a$
- Conservation Law: Total energy and momentum in an isolated system remains constant.
- Integration / Differentiation: $d/dx(e^x) = e^x$; $\int (1/x) dx = \ln|x| + C$

3. Sample Solved Question:

Problem: Calculate the net electrostatic force acting on a point charge in a uniform electric field.

Solution: By applying Coulomb's Law and vector superposition, $F_{\text{net}} = q * E_{\text{net}} = (1.6e-19 \text{ C}) * (500 \text{ N/C})$.

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Calculus & Differential Equations Complete Guide - Part 3

Mathematics - Integrals & Applications

1. Overview and Core Theoretical Principles:

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- Fundamental Law: $E = mc^2$ / Ohm's Law: $V = I * R$ / Newton's Second Law: $F = m * a$
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Final Result: Force = $8.0 \times 10^{-17} \, \text{N}$ along the field direction.

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Calculus & Differential Equations Complete Guide - Part 4

Mathematics - Integrals & Applications

1. Overview and Core Theoretical Principles:

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- Fundamental Law: $E = mc^2$ / Ohm's Law: $V = I * R$ / Newton's Second Law: $F = m * a$
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3. Sample Solved Question:

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Final Result: Force = $8.0 \times 10^{-17} \, \text{N}$ along the field direction.

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