

Differential Equations — CBSE Pattern Test 1

Class 12 Maths · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 1 — CBSE Pattern (90 minutes, 40 marks)

Class 12 Maths · Differential Equations · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.

(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.

(3) For MCQ questions choose the single correct option; for VSA answers write a single line.

(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

- The order of a differential equation is the order of the
 - highest derivative present
 - lowest derivative
 - function itself
 - independent variable
- The degree of a differential equation is the power of the
 - highest-order derivative
 - lowest derivative
 - constant term
 - independent variable
- The order of $d^2y/dx^2 + 3 dy/dx + 2y = 0$ is
 - 2
 - 1
 - 3
 - 0
- A differential equation is formed by
 - eliminating arbitrary constants
 - differentiating constants
 - integrating constants
 - adding constants
- A variable-separable equation can be written as
 - $f(x) dx = g(y) dy$
 - $f(x) f(y) = 0$
 - $x = y$
 - $dy/dx = 0$
- The solution of $dy/dx = y/x$ is
 - $y = Cx$
 - $y = C/x$
 - $y = x^2 + C$
 - $y = \ln x + C$
- For homogeneous equations, we substitute
 - $y = vx$

(B) $y = x + v$

(C) $x = v$

(D) $y = v/x$

8. The integrating factor for $dy/dx + P(x)y = Q(x)$ is

(A) $e^{\int P dx}$

(B) $\int P dx$

(C) $P(x)$

(D) $e^{\{P\}}$

9. Define the order of a differential equation.

10. Define a homogeneous differential equation.

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. Define the degree of a differential equation.

12. How is a differential equation formed?

13. When can variables be separated in a differential equation?

14. What substitution is used for homogeneous equations?

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. Find the order and degree of $dy/dx + y = x$.

16. Form the differential equation from $y = mx$.

17. Solve $dy/dx = x/y$.

18. Solve $dy/dx + y = e^{-x}$.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. Solve $dy/dx = (x + y)/(x - y)$.

20. Solve $x dy/dx + y = x^3$. Form the differential equation from $y = A e^{2x} + B e^{-2x}$.

Answer Key (Marking Scheme)

Q1 — (A) highest derivative present. Q2 — (A) highest-order derivative. Q3 — (A) 2. Q4 — (A) eliminating arbitrary constants.

Q5 — (A) $f(x) dx = g(y) dy$. Q6 — (A) $y = Cx$. Q7 — (A) $y = vx$. Q8 — (A) $e^{\int P dx}$.

Q9 — The order of the highest derivative in the equation.

Q10 — $dy/dx = F(x, y)$ where F is homogeneous of degree 0.

Q11 — The power of the highest-order derivative.

Q12 — By eliminating arbitrary constants through differentiation.

Q13 — When the equation can be written as $f(x) dx = g(y) dy$.

Q14 — $y = vx$.

Q15 — Order 1, degree 1.

Q16 — $x dy/dx = y$.

Q17 — $y^2 = x^2 + C$.

Q18 — $y = e^{-x}(x + C)$.

Q19 — $x^2 - 2xy - y^2 = C$.

Q20 — $y = x^3/4 + C/x$; $d^2y/dx^2 - 4y = 0$.