

Differential Equations — CBSE Pattern Test 2

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

Test 2 — 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 degree of $(dy/dx)^3 + y = 0$ is
 - 3
 - 1
 - 2
 - 0
- If there are n arbitrary constants, the order of the differential equation is
 - n
 - $n - 1$
 - $n + 1$
 - 1
- The family $y = mx$ represents
 - lines through the origin
 - circles
 - parabolas
 - exponentials
- To solve $dy/dx = f(x)g(y)$, we
 - separate the variables and integrate
 - differentiate again
 - take logarithms
 - square both sides
- The general solution of $dy/dx = ky$ is
 - $y = C e^{kx}$
 - $y = Cx$
 - $y = kx + C$
 - $y = C/kx$
- The degree of homogeneity of $(x^2 + y^2)$ is
 - 2
 - 1
 - 0
 - 3
- After substituting $y = vx$, the equation becomes
 - separable in v and x

(B) constant

(C) linear in y

(D) trivial

8. A linear differential equation of the first order has the form

(A) $dy/dx + P(x)y = Q(x)$

(B) $dy/dx = y^2$

(C) $y dy/dx = x$

(D) $(dy/dx)^2 = y$

9. Find the degree of $(dy/dx)^3 + y = 0$.

10. Write the standard form of a linear differential equation.

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

11. Find the order of $d^2y/dx^2 + y = 0$.

12. If a family has n arbitrary constants, what is the order of the differential equation?

13. Write the general solution of $dy/dx = ky$.

14. Write the integrating factor for $dy/dx + P(x)y = Q(x)$.

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

15. Find the order and degree of $(d^2y/dx^2)^2 + y = 0$.

16. Form the differential equation representing $y = a \cos x + b \sin x$.

17. Solve $dy/dx = 2x$.

18. Solve $dy/dx + (1/x)y = x$.

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

19. Solve $(x^2 + y^2) dy/dx = 2xy$.

20. Solve $dy/dx + 2y = e^{-x}$. Solve $dy/dx = e^{x+y}$.

Answer Key (Marking Scheme)

Q1 — (A) 3. Q2 — (A) n . Q3 — (A) lines through the origin. Q4 — (A) separate the variables and integrate.

Q5 — (A) $y = C e^{kx}$. Q6 — (A) 2. Q7 — (A) separable in v and x . Q8 — (A) $dy/dx + P(x)y = Q(x)$.

Q9 — 3.

Q10 — $dy/dx + P(x)y = Q(x)$.

Q11 — 2.

Q12 — n .

Q13 — $y = C e^{kx}$.

Q14 — $e^{\int P dx}$.

Q15 — Order 2, degree 2.

Q16 — $d^2y/dx^2 + y = 0$.

Q17 — $y = x^2 + C$.

Q18 — $y = x^2/3 + C/x$.

Q19 — $x^2 - 2xy - y^2 = C$.

Q20 — $y = (x/3)e^{-x} + Ce^{-2x}$; $e^{-y} + e^x = C$.