

Continuity and Differentiability — 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 · Continuity and Differentiability · 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)

1. The function $f(x) = |x|$ at $x = 0$ is
 - (A) continuous but not differentiable
 - (B) differentiable
 - (C) discontinuous
 - (D) constant
2. The derivative of a constant function is
 - (A) 0
 - (B) 1
 - (C) the constant
 - (D) undefined
3. The quotient rule states $(u/v)' =$
 - (A) $(u'v - uv')/v^2$
 - (B) $(u'v + uv')/v^2$
 - (C) u'/v'
 - (D) uv'/v^2
4. The derivative of $\sin x$ is
 - (A) $\cos x$
 - (B) $-\cos x$
 - (C) $\sin x$
 - (D) $-\sin x$
5. For implicit differentiation, we differentiate
 - (A) both sides with respect to x
 - (B) only y
 - (C) only x
 - (D) neither side
6. If $x = t^2$, $y = t^3$, then dy/dx equals
 - (A) $3t/2$
 - (B) $3t^2$
 - (C) $2t$
 - (D) t
7. If f is continuous at $x = a$, then $\lim_{x \rightarrow a} f(x)$ equals
 - (A) $f(a)$

- (B) 0
 (C) undefined
 (D) $f'(a)$
8. Is $|x|$ differentiable at $x = 0$?
 (A) No
 (B) Yes
 (C) Only from the right
 (D) Only from the left
9. Define differentiability of a function at a point.
10. Write the derivative of x^n .

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

11. Is every polynomial function continuous?
12. Is $|x|$ differentiable at $x = 0$?
13. Write the derivative of $\log x$.
14. If $x = t^2$, $y = t^3$, find dy/dx .

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

15. Discuss the continuity of $f(x) = 1/(x - 1)$ at $x = 1$.
16. Find the derivative of $f(x) = x^3$ from first principles.
17. Differentiate $x^2 \sin x$ using the product rule.
18. Differentiate x^x with respect to x .

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

19. Differentiate $(x^2 + 1)/(x + 1)$ using the quotient rule. Differentiate $(\sin x)^x$ with respect to x .
20. Show that $f(x) = x^2$ is differentiable at $x = 3$ and find $f'(3)$. Find dy/dx if $x = a \cos \theta$, $y = a \sin \theta$.

Answer Key (Marking Scheme)

- Q1 — (A) continuous but not differentiable. Q2 — (A) 0. Q3 — (A) $(u'v - uv')/v^2$. Q4 — (A) $\cos x$.
 Q5 — (A) both sides with respect to x . Q6 — (A) $3t/2$. Q7 — (A) $f(a)$. Q8 — (A) No.
 Q9 — The derivative exists at the point.
 Q10 — $n x^{n-1}$.
 Q11 — Yes.
 Q12 — No.
 Q13 — $1/x$.
 Q14 — $3t/2$.
 Q15 — Discontinuous at $x = 1$.
 Q16 — $3x^2$.
 Q17 — $2x \sin x + x^2 \cos x$.
 Q18 — $x^x(1 + \ln x)$.
 Q19 — $((2x)(x + 1) - (x^2 + 1)(1))/(x + 1)^2$; $(\sin x)^x(x \cot x + \ln \sin x)$.

Q20 — $f'(3) = 6$; $dy/dx = -\cot \theta$.