

Continuity and Differentiability — 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 · 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)

- A function f is continuous at $x = a$ if
 - $\lim_{x \rightarrow a} f(x) = f(a)$
 - $f(a) = 0$
 - $\lim_{x \rightarrow a} f(x) = 0$
 - f is differentiable
- For continuity at $x = a$, the left-hand limit and right-hand limit must be
 - equal and equal to $f(a)$
 - unequal
 - both zero
 - both infinite
- A polynomial function is continuous
 - everywhere on $\mathbb{R}$
 - nowhere
 - only at $x = 0$
 - only on $[0, 1]$
- A function f is differentiable at $x = a$ if
 - the derivative exists at $x = a$
 - it is continuous
 - $f(a) = 0$
 - the limit is infinite
- Differentiability implies
 - continuity
 - discontinuity
 - nothing
 - periodicity
- The derivative of x^n is
 - $n x^{n-1}$
 - x^{n+1}
 - $n x^n$
 - x^n/n
- The product rule states $(uv)' =$
 - $u'v + uv'$

- (B) $u'v'$
- (C) $u'v - uv'$
- (D) uv

8. The derivative of $\log x$ is

- (A) $1/x$
- (B) x
- (C) $\log x$
- (D) 1

9. Define continuity of a function at a point.

10. Write the derivative of $\sin x$.

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

- 11. State the condition for continuity at $x = a$.
- 12. Does differentiability imply continuity?
- 13. State the product rule.
- 14. When is logarithmic differentiation used?

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

- 15. Check the continuity of $f(x) = x^2$ at $x = 2$.
- 16. Differentiate $x^3 + 2x$ with respect to x .
- 17. Differentiate $x \sin x$ with respect to x .
- 18. Find dy/dx if $x^2 + y^2 = 25$.

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

- 19. Check the continuity of $f(x) = |x|$ at $x = 0$.
- 20. Show that $f(x) = |x|$ is continuous but not differentiable at $x = 0$. Find the value of k so that $f(x) = kx + 1$ for $x \leq 2$ and $3x - 1$ for $x > 2$ is continuous at $x = 2$.

Answer Key (Marking Scheme)

- Q1 — (A) $\lim_{x \rightarrow a} f(x) = f(a)$. Q2 — (A) equal and equal to $f(a)$. Q3 — (A) everywhere on $\mathbb{R}$. Q4 — (A) the derivative exists at $x = a$.
- Q5 — (A) continuity. Q6 — (A) $n x^{n-1}$. Q7 — (A) $u'v + uv'$. Q8 — (A) $1/x$.
- Q9 — $\lim_{x \rightarrow a} f(x) = f(a)$.
- Q10 — $\cos x$.
- Q11 — $LHL = RHL = f(a)$.
- Q12 — Yes.
- Q13 — $(uv)' = u'v + uv'$.
- Q14 — For products/quotients of powers and exponential functions.
- Q15 — Continuous.
- Q16 — $3x^2 + 2$.
- Q17 — $x \cos x + \sin x$.

Q18 — $-x/y$.

Q19 — Continuous at $x = 0$.

Q20 — Proof as in notes; $k = 2$.