CLASS 12 MATHEMATICS EXTRA QUESTIONS

Class 12 Mathematics Chapter 5 Continuity and Differentiability – Extra Questions with Answers

Extra practice questions for Class 12 Maths Chapter 5 (Continuity and Differentiability), beyond the textbook. These Class 12 Mathematics Chapter 5 important questions are handy for last-minute exam practice.

Contents

Extra practice questions for Class 12 Maths Chapter 5 (Continuity and Differentiability), beyond the textbook. These Class 12 Mathematics Chapter 5 important questions are handy for last-minute exam practice.

Very Short Answer Questions (1 mark)

Q1. State the condition for continuity of f at x=a.
Ans: $\lim_{x\to a} f(x)=f(a)$.

Q2. Is |x| differentiable at x=0?
Ans: No, the left and right derivatives differ (−1 and 1).

Q3. What is d/dx(e^x)?
Ans: e^x.

Q4. What is d/dx(log x)?
Ans: 1/x.

Q5. State the chain rule for y=f(g(x)).
Ans: dy/dx=f'(g(x))·g'(x).

Short Answer Questions (2–3 marks)

Q6. Differentiate $y=\sin(x^2)$ with respect to x.
Ans: Using chain rule, $dy/dx=\cos(x^2)\cdot 2x=2x\cos(x^2)$.

Q7. Find dy/dx if $x^2+y^2=25$ (implicit differentiation).
Ans: Differentiating both sides: 2x+2y(dy/dx)=0, so dy/dx=−x/y.

Q8. Differentiate $y=x^x$ using logarithmic differentiation.
Ans: Take log: log y=x log x. Differentiate: (1/y)(dy/dx)=log x+1, so dy/dx=y(log x+1)=x^x(log x+1).

Higher-Order Thinking / Application Questions

Q9. Examine the continuity and differentiability of f(x)=|x−1| at x=1, showing all reasoning using left-hand and right-hand limits and derivatives.
Ans: For continuity at x=1: LHL=$\lim_{x\to 1^-}|x-1|=\lim_{h\to 0}|(1-h)-1|=\lim_{h\to 0}h=0$.
RHL=$\lim_{x\to 1^+}|x-1|=\lim_{h\to 0}|(1+h)-1|=\lim_{h\to 0}h=0$. f(1)=|1−1|=0. Since LHL=RHL=f(1)=0, f is continuous at x=1.
For differentiability: LHD=$\lim_{h\to 0}[f(1-h)-f(1)]/(-h)=\lim_{h\to 0}[h-0]/(-h)=-1$.
RHD=$\lim_{h\to 0}[f(1+h)-f(1)]/h=\lim_{h\to 0}[h-0]/h=1$. Since LHD=−1≠RHD=1, f is NOT differentiable at x=1, despite being continuous there — this is a classic example demonstrating that continuity does not guarantee differentiability, because the graph has a sharp corner (kink) at x=1 even though there is no break or jump.

Q10. State Rolle's Theorem and verify it for $f(x)=x^2-4x+3$ on the interval [1,3], finding the value of c explicitly.
Ans: Rolle's Theorem states that if f is continuous on [a,b], differentiable on (a,b), and f(a)=f(b), then there exists at least one c∈(a,b) such that f'(c)=0. Here $f(x)=x^2-4x+3$ is a polynomial, so it is continuous on [1,3] and differentiable on (1,3), satisfying the first two conditions. Check f(1)=1−4+3=0 and f(3)=9−12+3=0, so f(1)=f(3)=0, satisfying the third condition. By Rolle's Theorem, there must exist c∈(1,3) with f'(c)=0. Now f'(x)=2x−4, so setting f'(c)=0 gives 2c−4=0, i.e., c=2. Since 2∈(1,3), this confirms Rolle's Theorem holds, and geometrically it means the tangent to the parabola is horizontal at x=2, which is the vertex of the

parabola exactly midway between the two roots x=1 and x=3.

Class 12 Mathematics Chapter 5 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the Class 12 Mathematics Chapter 5 Solutions and Class 12 Mathematics Chapter 5 Revision Notes.

See also: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4 | Chapter 5

Practice more: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4

Quick revision: Chapter 1 | Chapter 2 | Chapter 3 | Chapter 4