Multiple choice questions - Differentiation and its applications

Year: University Year 1 · 10

Question 1 $\frac{d}{dx}(x \ln x) =$

- **A.** $\ln x$
- **B.** $\ln x + 1$
- **C.** $1/x$
- **D.** $x + \ln x$

Question 2 If f is differentiable at a then f is

- **A.** continuous at a
- **B.** increasing at a
- **C.** constant near a
- **D.** twice differentiable at a

Question 3 The MVT guarantees a point where $f'(c) =$

- **A.** 0
- **B.** $\frac{f(b)-f(a)}{b-a}$
- **C.** $f(c)$
- **D.** $\frac{f(b)+f(a)}{2}$

Question 4 The Maclaurin series of $\cos x$ begins

- **A.** $1 - \frac{x^2}{2} + \dots$
- **B.** $x - \frac{x^3}{6} + \dots$
- **C.** $1 + x + \dots$
- **D.** $1 - x^2 + \dots$

Question 5 $\lim_{x \to 0} \frac{\sin x - x}{x^3} =$

- **A.** 0
- **B.** $-\frac{1}{6}$
- **C.** $\frac{1}{6}$
- **D.** 1

Question 6 At a stationary point $f''(c) > 0$ means

- **A.** local maximum

- ◯ **B.** local minimum
- ◯ **C.** point of inflection
- ◯ **D.** no information

Question 7 $|x|$ at 0 is

- ◯ **A.** differentiable
- ◯ **B.** continuous but not differentiable
- ◯ **C.** discontinuous
- ◯ **D.** constant

Question 8 $\frac{d}{dx}\arctan x =$

- ◯ **A.** $\frac{1}{1-x^2}$
- ◯ **B.** $\frac{1}{1+x^2}$
- ◯ **C.** $\sec^2 x$
- ◯ **D.** $\frac{1}{\sqrt{1+x^2}}$

Question 9 L'Hopital's rule applies to a limit of the form

- ◯ **A.** $\frac{0}{0}$ or $\frac{\infty}{\infty}$
- ◯ **B.** $\frac{1}{0}$
- ◯ **C.** $\frac{5}{3}$
- ◯ **D.** $0+0$

Question 10 Rolle's theorem needs

- ◯ **A.** $f(a)=f(b)$
- ◯ **B.** f increasing
- ◯ **C.** $f(a)=0$
- ◯ **D.** f even

Answer grid - Differentiation and its applications

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Question	Answer	Explanation
1	**B**	Product rule: $\ln x + x \cdot \frac{1}{x}$.
2	**A**	Differentiability implies continuity.
3	**B**	The tangent is parallel to the chord.
4	**A**	$\cos 0 = 1$ and $\cos'' 0 = -1$.
5	**B**	$\sin x = x - \frac{x^3}{6} + \ldots$
6	**B**	Second derivative test.
7	**B**	One-sided gradients ± 1.
8	**B**	Standard derivative.
9	**A**	It needs an indeterminate quotient.
10	**A**	Equal end values (plus continuity and differentiability).