

Limits and Derivatives — Assignment 1

Class 11 Maths · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Intuitive Idea of a Limit

MCQ Questions (choose the correct option)

- The limit $x \rightarrow a$ means x approaches a
 - from both sides
 - only from the left
 - only from the right
 - equal to a
- $\lim_{x \rightarrow 2} (x + 3)$ is
 - 5
 - 2
 - 3
 - 6
- The value of $\lim_{x \rightarrow 1} (x^2 - 1)/(x - 1)$ is
 - 2
 - 0
 - 1
 - undefined
- If $\lim_{x \rightarrow a} f(x) = L$, then $f(x)$ gets arbitrarily close to
 - L
 - 0
 - a
 - ∞

1 Mark Questions

- What does $x \rightarrow a$ mean?
- Find $\lim_{x \rightarrow 3} (2x + 1)$.
- Write $\lim_{x \rightarrow 1} (x^2 - 1)/(x - 1)$.

2 Mark Questions

- Evaluate $\lim_{x \rightarrow 2} (x^2 - 4)/(x - 2)$.
- Evaluate $\lim_{x \rightarrow 0} (x^2 + 3x)/x$.

3 Mark Questions

- Evaluate $\lim_{x \rightarrow 1} (x^3 - 1)/(x - 1)$.
- Evaluate $\lim_{x \rightarrow 2} (x^3 - 8)/(x^2 - 4)$.

Left-Hand and Right-Hand Limits

MCQ Questions (choose the correct option)

- The left-hand limit of $f(x)$ at $x = a$ is denoted by
 - $\lim (x \rightarrow a^-) f(x)$
 - $\lim (x \rightarrow a^+) f(x)$
 - $f(a)$
 - $\lim (x \rightarrow \infty) f(x)$
- $\lim (x \rightarrow a) f(x)$ exists if
 - LHL = RHL
 - LHL $\neq$ RHL
 - LHL = 0
 - RHL = 0
- For $f(x) = |x|$ at $x = 0$, the left-hand limit is
 - 0
 - 1
 - 1
 - does not exist
- For the greatest integer function at $x = 1$, the left-hand limit is
 - 0
 - 1
 - 2
 - does not exist

1 Mark Questions

- Write the notation for the left-hand limit of f at a .
- State the condition for $\lim (x \rightarrow a) f(x)$ to exist.
- Find the left-hand limit of $|x|$ at $x = 0$.

2 Mark Questions

- Find LHL and RHL of $f(x) = |x - 2|$ at $x = 2$.
- For $f(x) = 1$ if $x < 0$, 2 if $x > 0$, find $\lim (x \rightarrow 0) f(x)$.

3 Mark Questions

- Find LHL and RHL of $f(x) = x + 1$ for $x \geq 1$ and $x - 1$ for $x < 1$ at $x = 1$ and decide if the limit exists.
- For the greatest integer function $f(x) = [x]$, find LHL and RHL at $x = 2$ and discuss the existence of the limit.

Algebra of Limits and Standard Limits

MCQ Questions (choose the correct option)

- $\lim (x \rightarrow 0) (\sin x)/x$ equals
 - 1
 - 0
 - ∞
 - undefined
- $\lim (x \rightarrow 0) (1 - \cos x)/x^2$ equals

- (A) $1/2$
 - (B) 1
 - (C) 0
 - (D) 2
3. $\lim (x \rightarrow a) [f(x) + g(x)]$ equals
- (A) $\lim f + \lim g$
 - (B) $\lim f \times \lim g$
 - (C) $\lim f - \lim g$
 - (D) $\lim f / \lim g$
4. $\lim (x \rightarrow 0) (e^x - 1)/x$ equals
- (A) 1
 - (B) 0
 - (C) e
 - (D) ∞

1 Mark Questions

1. Evaluate $\lim (x \rightarrow 0) (\sin x)/x$.
2. Evaluate $\lim (x \rightarrow 0) (1 - \cos x)/x^2$.
3. State the sum rule for limits.

2 Mark Questions

1. Evaluate $\lim (x \rightarrow 0) (\tan x)/x$.
2. Evaluate $\lim (x \rightarrow 0) (1 - \cos 2x)/x^2$.

3 Mark Questions

1. Evaluate $\lim (x \rightarrow 0) (\sin 3x)/(\sin 5x)$.
2. Evaluate $\lim (x \rightarrow 0) (1 - \cos 4x)/(1 - \cos 2x)$.

Continuity of a Function at a Point

MCQ Questions (choose the correct option)

1. A function f is continuous at $x = a$ if
 - (A) $\lim (x \rightarrow a) f(x) = f(a)$
 - (B) $\lim (x \rightarrow a) f(x) = 0$
 - (C) $f(a) = 0$
 - (D) $\text{LHL} \neq \text{RHL}$
2. If $\lim (x \rightarrow a) f(x)$ exists but is not equal to $f(a)$, the function is
 - (A) discontinuous at a
 - (B) continuous at a
 - (C) differentiable at a
 - (D) constant
3. Polynomial functions are continuous
 - (A) everywhere
 - (B) nowhere
 - (C) only at 0

- (D) only at positive numbers
4. $f(x) = 1/x$ is discontinuous at
- (A) $x = 0$
- (B) $x = 1$
- (C) $x = -1$
- (D) all points

1 Mark Questions

1. State the condition for continuity of f at $x = a$.
2. Is every polynomial function continuous?
3. Where is $f(x) = 1/x$ discontinuous?

2 Mark Questions

1. Check the continuity of $f(x) = x^2 + 2$ at $x = 1$.
2. Check the continuity of $f(x) = |x|$ at $x = 0$.

3 Mark Questions

1. Discuss the continuity of $f(x) = x + 2$ for $x \geq 0$ and $x - 2$ for $x < 0$ at $x = 0$.
2. Find k so that $f(x) = kx + 1$ for $x \leq 2$ and $3x - 5$ for $x > 2$ is continuous at $x = 2$.

Derivative as a Limit (First Principle)

MCQ Questions (choose the correct option)

1. The derivative of $f(x)$ from first principles is

(A) $\lim_{h \rightarrow 0} [f(x + h) - f(x)]/h$

(B) $\lim_{h \rightarrow 0} [f(x + h) + f(x)]/h$

(C) $f(x)/h$

(D) $f(x + h)$
2. The derivative of $f(x) = x^2$ from first principles is

(A) $2x$

(B) x

(C) x^2

(D) 2
3. The derivative represents the

(A) slope of the tangent to the curve

(B) area under the curve

(C) intercept

(D) vertex
4. If $f(x) = \sin x$, then $f'(x)$ from first principles is

(A) $\cos x$

(B) $\sin x$

(C) $-\cos x$

(D) $-\sin x$

1 Mark Questions

1. Write the definition of the derivative from first principles.
2. Find the derivative of x^2 from first principles.
3. What does the derivative represent geometrically?

2 Mark Questions

1. Find the derivative of $f(x) = 3x + 2$ from first principles.
2. Find the derivative of $f(x) = x^3$ from first principles.

3 Mark Questions

1. Find the derivative of $f(x) = \sin x$ from first principles.
2. Find the derivative of $f(x) = \sqrt{x}$ from first principles.

Algebra of Derivatives

MCQ Questions (choose the correct option)

1. $d/dx [f(x) + g(x)]$ equals
 - (A) $f'(x) + g'(x)$
 - (B) $f'(x) g'(x)$
 - (C) $f'(x) - g'(x)$
 - (D) $f(x) g'(x)$
2. The product rule is
 - (A) $(uv)' = u'v + uv'$
 - (B) $(uv)' = u'v'$
 - (C) $(uv)' = u'v - uv'$
 - (D) $(uv)' = u + v$
3. The quotient rule is
 - (A) $(u/v)' = (u'v - uv')/v^2$
 - (B) $(u/v)' = u'/v'$
 - (C) $(u/v)' = (u'v + uv')/v^2$
 - (D) $(u/v)' = u - v$
4. $d/dx [c f(x)]$ where c is a constant equals
 - (A) $c f'(x)$
 - (B) $f'(x)$
 - (C) $c + f'(x)$
 - (D) 0

1 Mark Questions

1. State the sum rule for derivatives.
2. State the product rule for derivatives.
3. Write the quotient rule for derivatives.

2 Mark Questions

1. Differentiate $f(x) = x^3 + 2x^2 - 5x + 1$.
2. Differentiate $f(x) = x \sin x$ using the product rule.

3 Mark Questions

1. Differentiate $f(x) = x/(x + 1)$ using the quotient rule.
2. Differentiate $f(x) = (x^2 + 1)(x + 2)$ using the product rule.

Derivatives of Standard Functions

MCQ Questions (choose the correct option)

1. $d/dx (x^n)$ equals
 - (A) $n x^{(n-1)}$
 - (B) $x^{(n+1)}$
 - (C) $n x^n$
 - (D) x^n/n
2. $d/dx (\sin x)$ equals
 - (A) $\cos x$
 - (B) $-\cos x$
 - (C) $\sin x$
 - (D) $-\sin x$
3. $d/dx (\cos x)$ equals
 - (A) $-\sin x$
 - (B) $\sin x$
 - (C) $\cos x$
 - (D) $-\cos x$
4. $d/dx (e^x)$ equals
 - (A) e^x
 - (B) $x e^x$
 - (C) e^x/x
 - (D) 1

1 Mark Questions

1. Write the derivative of x^n .
2. Write the derivative of $\sin x$.
3. Write the derivative of e^x .

2 Mark Questions

1. Differentiate $f(x) = 3x^4 - 2x^2 + 7$.
2. Differentiate $f(x) = 2 \sin x + 3 \cos x$.

3 Mark Questions

1. Differentiate $f(x) = \tan x$ (using $\sin x$ and $\cos x$).
2. Differentiate $f(x) = (x^2 + 1)/x$ using the quotient rule.