# CLASS XI – MATHEMATICS (041)
## CHAPTER 12 : LIMITS AND DERIVATIVES
## PRACTICE PAPER (SESSION 2026–27)

**Maximum Marks: 40** **Time Allowed: 1½ Hours**

**General Instructions:**

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 23 questions. All questions are compulsory.
2. This question paper is divided into five Sections – A, B, C, D and E.
3. In Section A, Questions 1 to 12 are Multiple Choice Questions (MCQs) and Questions 13 and 14 are Assertion–Reason based questions of 1 mark each.
4. In Section B, Questions 15 to 18 are Very Short Answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Questions 19 to 21 are Short Answer (SA) type questions, carrying 3 marks each.
6. In Section D, Question 22 is a Long Answer (LA) type question, carrying 5 marks.
7. In Section E, Question 23 is a case study based question, carrying 4 marks.
8. There is no overall choice. However, an internal choice has been provided in 2 questions of Section B (Q17, Q18), 2 questions of Section C (Q20, Q21), in Q22 of Section D and in one sub-part of Q23 of Section E.
9. Draw neat and clean figures wherever required. Use of calculators is not allowed.

**SECTION – A** **(14 × 1 = 14)**

**This section comprises of 12 multiple choice questions (Q1–Q12) and 2 assertion–reason based questions (Q13–Q14) of 1 mark each.**

| No. | Questions | Marks |
|---|---|---|
| **Q1.** | Fig. 1 shows the graph of a function y = f(x). The open circle at (2, 3) shows a missing point of the graph, and the dot at (2, 5) shows the value f(2). The value of $\lim_{x\to 2} f(x) + f(2)$ is | **1** |

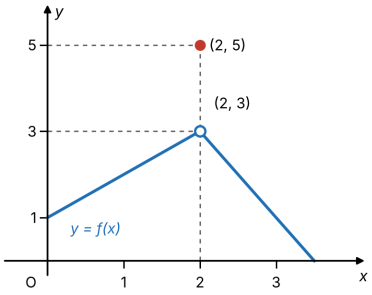



*Fig. 1*

(A) 3 (B) 5

(C) 8 (D) does not exist

**Q2.** Fig. 2 shows the graph of y = f(x). The filled dot is at (1, 3) and the open circle is at (1, 2). Which of the following is correct? **1**

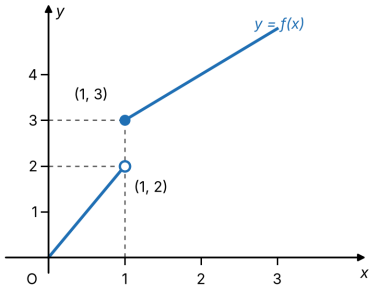



*Fig. 2*

(A) $\lim_{x\to1}$ f(x) exists and equals 2

(B) $\lim_{x\to1}$ f(x) exists and equals 3

(C) $\lim_{x\to1}$ f(x) exists and equals 5

(D) $\lim_{x\to1}$ f(x) does not exist

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**Q3.** The value of $\lim_{x\to2} (x^3 - 8)/(x - 2)$ is **1**

(A) 12

(B) 8

(C) 6

(D) 0

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**Q4.** The value of $\lim_{x\to0} (\tan 5x)/x$ is **1**

(A) 1/5

(B) 5

(C) 0

(D) does not exist

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**Q5.** The derivative of $f(x) = x^4 - 3x^2 + 7$ at x = 2 is **1**

(A) 10

(B) 14

(C) 20

(D) 32

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**Q6.** Let f(x) = 2x + k for x < 3 and f(x) = 10 for x ≥ 3. If $\lim_{x\to3}$ f(x) exists, then k equals **1**

(A) 4

(B) 3

(C) 6

(D) 10

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**Q7.** The derivative of f(x) = x/(x + 2), x ≠ –2, is **1**

(A) $1/(x + 2)^2$

(B) $-2/(x + 2)^2$

(C) $2/(x + 2)$

(D) $2/(x + 2)^2$

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**Q8.** Fig. 3 shows the curve $y = x^2$ with the chord PQ joining P(1, 1) and Q(3, 9). The slope of the chord PQ and the slope of the tangent to the curve at P are respectively **1**

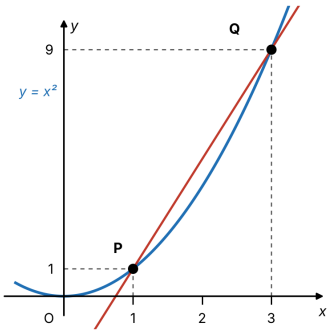



*Fig. 3*

(A) 8 and 2

(B) 4 and 2

(C) 4 and 1

(D) 8 and 4

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**Q9.** The value of $d/dx\ (x^2 \sin x)$ at $x = \pi/2$ is **1**

(A) $\pi$ (B) $\pi/2$

(C) $\pi^2/4$ (D) 0

**Q10.** The value of $\lim_{x\to 0} (1 - \cos 4x)/x^2$ is **1**

(A) 2 (B) 4

(C) 16 (D) 8

**Q11.** The value of $\lim_{h\to 0} [(2 + h)^5 - 32]/h$ is **1**

(A) 40 (B) 80

(C) 160 (D) 32

**Q12.** The value of $\lim_{x\to \pi/2} (\cos x)/(\pi/2 - x)$ is **1**

(A) 0 (B) –1

(C) 1 (D) 2

**Assertion–Reason Based Questions**

*Directions:* Question numbers 13 and 14 are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below:
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

**Q13.** **Assertion (A):** $\lim_{x\to 3} (x^2 - 9)/(x - 3) = 6$. **1**
**Reason (R):** The limit of a quotient of two functions is always equal to the quotient of their limits, even when the limit of the denominator is zero.

**Q14.** **Assertion (A):** The derivative of $f(x) = x^2$ at $x = 3$ is 6. **1**
**Reason (R):** The derivative of a constant function is zero.

## SECTION – B (4 × 2 = 8)

**This section comprises of 4 very short answer (VSA) type questions of 2 marks each.**

**Q15.** Fig. 4 shows the graph of $g(x) = (x^2 - 9)/(x - 3)$, $x \neq 3$. The open circle at (3, 6) shows that the point is missing from the graph. **2**

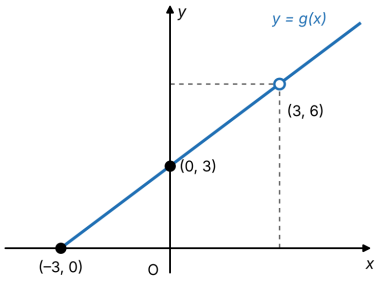



*Fig. 4*

(i) Why is g(3) not defined, and what does the graph suggest about $\lim_{x\to 3} g(x)$? **[1]**
(ii) Verify your answer to (i) algebraically. **[1]**

**Q16.** Evaluate: $\lim_{x\to 0} (\sqrt{(4 + x)} - 2)/x$. **2**

**Q17.** **(A)** Evaluate: $\lim_{x\to 3} (x^2 - 5x + 6)/(x^2 - 9)$. **2**

**OR**

**(B)** Evaluate: $\lim_{x\to 0} (\tan 3x)/(\sin 4x)$.

**Q18.** **(A)** Find the derivative of $f(x) = 3x - x^2$ from the first principle. **2**

**OR**

**(B)** Find the derivative of $f(x) = (2x + 1)(3x^2 - x)$.

## SECTION – C (3 × 3 = 9)

**This section comprises of 3 short answer (SA) type questions of 3 marks each.**

**Q19.** Fig. 5 shows the curve $y = f(x)$, where $f(x) = x^2 - 2x$, and the tangent to the curve at the point P. The tangent makes an angle of 45° with the positive direction of the x-axis. **3**

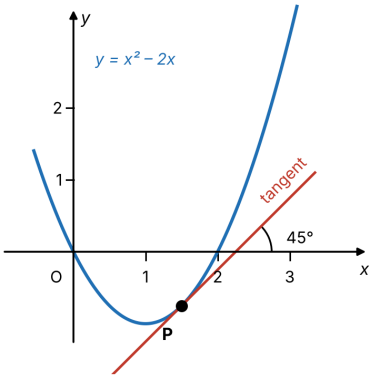



*Fig. 5*

(i) Find $f'(x)$ from the first principle. **[2]**

(ii) Hence find the coordinates of the point P. **[1]**

**Q20.** **(A)** Evaluate: $\lim_{x \to 0} (3x + \sin 2x)/(x + \tan x)$. **3**

**OR**

**(B)** Evaluate: $\lim_{x \to 1} (x^7 - 1)/(\sqrt{x} - 1)$.

**Q21.** **(A)** Find the derivative of $\sin x/(1 + \cos x)$. **3**

**OR**

**(B)** Find the derivative of $f(x) = 1/(x + 2)$ from the first principle.

## SECTION – D (1 × 5 = 5)

**This section comprises of 1 long answer (LA) type question of 5 marks.**

**Q22.** **(A)** Let $f(x) = ax + b$ for $x < 1$, $f(1) = 6$ and $f(x) = 2ax - b$ for $x > 1$. If $\lim_{x \to 1} f(x) = f(1)$, find the values of a and b, and hence find $\lim_{x \to 2} f(x)$. **5**

**OR**

**(B)** Find the derivative of $f(x) = \cos 2x$ from the first principle and hence find its value at $x = \pi/4$. **[5]**

## SECTION – E (1 × 4 = 4)

**This section comprises of 1 case study based question of 4 marks with sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively.**

**Q23.** **Case Study:** A small stone is dropped from the top of a tall cliff on a distant planet. The distance s (in metres) fallen by the stone in t seconds is given by $s = 5t^2$. Fig. 6 shows the graph of s against t. A and B are the points on the graph at t = 2 and t = 3 respectively. The green dashed line is the secant AB and the red line is the tangent at A. **4**

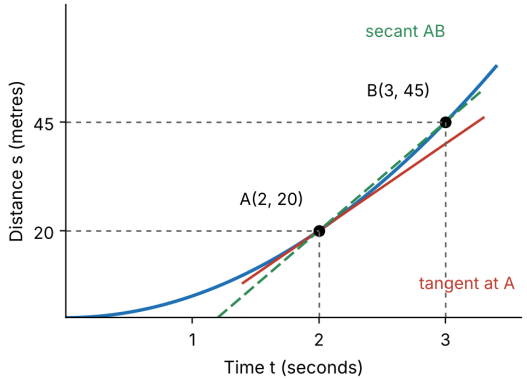



*Fig. 6*

Based on the given information, answer the following questions:

(i) Find the average velocity of the stone between t = 2 and t = 3. **[1]**

(ii) Find the average velocity between t = 2 and t = 2 + h in terms of h. **[1]**

(iii) **(a)** Find s′(t) from the first principle and hence the velocity of the stone at t = 2. **[2]**

**OR**

**(b)** Find the slope of the tangent to the graph at B, and the time t at which the slope of the tangent is 50. **[2]**

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**— End of Question Paper —**