Mathematics — Ganita Manjari

Chapter 4 Test 9

Exploring Algebraic Identities

Class IX | 2026–27

Time Allowed: 45 Minutes | Maximum Marks: 25

General Instructions

1. All 13 questions are compulsory. Choose one option in A; show working in B–D.
2. Use suitable identities and show the main steps. Calculators are not allowed.
3. In rational expressions, state all restrictions from the original denominator.

SECTION A

(5 questions × 1 mark = 5 marks)

1. If $(x + 2)(x - 2) = x^2 + k$ for all x, then k is:

(A) 4 (B) 2

(C) −2 (D) −4

2. The expression $4x^2 + 20x + 25$ is zero when:

(A) $x = -\frac{5}{2}$ (B) $x = \frac{5}{2}$

(C) $x = -5$ (D) $x = 5$

3. A formula is correct for three chosen values of x. Does this alone prove that it is an identity?

(A) Yes, always

(B) Yes, if the values are integers

(C) No, a general justification is needed

(D) Only if one value is zero

4. The coefficient of x^2 in $(2x - 1)^3$ is:

(A) −6 (B) −12

(C) 12 (D) 6

5. Which simplification is valid for all $x \neq 0$?

(A) $\frac{x+2}{x} = 2$ (B) $\frac{x^2+1}{x} = x + 1$

(C) $\frac{x+1}{x} = 1$ (D) $\frac{x(x+2)}{x} = x + 2$

SECTION B

(4 questions × 2 marks = 8 marks)

6. Expand the following:

$$(x - \frac{y}{3})^3.$$

7. Factor the following, where $b \neq 0$:

$$27b^3 - \frac{1}{64b^3}.$$

8. Choose b to make the product easy and use this identity to calculate 65^2:

$$a^2 = (a + b)(a - b) + b^2.$$

9. If $a - b = 4$ and $a^2 + b^2 = 58$, find ab and $(a + b)^2$.

SECTION C

(3 questions × 3 marks = 9 marks)

10. Prove the following identity:

$(a + b + c)^2 + (a + b - c)^2 + (a - b + c)^2 + (a - b - c)^2 = 4(a^2 + b^2 + c^2)$.

11. Simplify the following and explain why a cancelled value is still excluded:

$$\frac{4x^2 + 4x + 1}{4x^2 - 1}.$$

12. Both $x - 2$ and $x - \frac{1}{2}$ are factors of the following quadratic, where $p \neq 0$.

Find p and r:

$$px^2 + 5x + r.$$

SECTION D

(1 application question × 3 marks = 3 marks)

13. A square panel has area $25a^2 - 30ab + 9b^2$ cm^2, with $5a > 3b$. Find its side and perimeter. Evaluate the perimeter for $a = 2, b = 1$.