

Q1. JEE Main 2026 (21 January Shift 2)

Let $f(x) = x^3 + x^2 f'(1) + 2x f''(2) + f'''(3)$, $x \in \mathbf{R}$. Then the value of $f'(5)$ is:

(1) $\frac{117}{5}$

(2) $\frac{657}{5}$

(3) $\frac{2}{5}$

(4) $\frac{62}{5}$

ANSWERS AND SOLUTIONS

1. (1)

1. (1) Let $a = f'(1)$, $b = f''(2)$, $c = f'''(3)$. Then $f(x) = x^3 + ax^2 + 2bx + c$.

Taking derivatives: $f'(x) = 3x^2 + 2ax + 2b$, $f''(x) = 6x + 2a$, $f'''(x) = 6$.

From $f'(1) = a$: $3 + 2a + 2b = a$ gives $a = -3 - 2b$.

From $f''(2) = b$: $12 + 2a = b$.

From $f'''(3) = c$: $c = 6$.

Substituting the first into the second: $b = 12 + 2(-3 - 2b) = 6 - 4b$ gives $5b = 6$, so $b = \frac{6}{5}$.

Then $a = -3 - \frac{12}{5} = -\frac{27}{5}$.

$$f(x) = x^3 - \frac{27}{5}x^2 + \frac{12}{5}x + 6$$

$$f'(x) = 3x^2 - \frac{54}{5}x + \frac{12}{5}$$

$$f'(5) = 75 - 54 + \frac{12}{5} = \frac{117}{5}$$