

## JEE MAIN RELATIONS AND FUNCTIONS — PYQS

**Max. Marks: 76**
**Questions: 19**

### Section A (MCQ) — 14 questions

**Q.1** Let  $[\cdot]$  denote the greatest integer function. If the domain of the function  $f(x) = \sin^{-1}\left(\frac{x + [x]}{3}\right)$  is  $[\alpha, \beta]$ , then  $\alpha^2 + \beta^2$  is equal to :

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 2      (2) 5      (3) 10      (4) 13

Scan or tap for the full solution



**Q.2** If the domain of the function  $f(x) = \log_{(10x^2 - 17x + 7)}(18x^2 - 11x + 1)$  is  $(-\infty, a) \cup (b, c) \cup (d, \infty) - \{e\}$ , then  $90(a + b + c + d + e)$  equals:

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) 170      (2) 316      (3) 177      (4) 307

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**Q.3** The sum of all the real solutions of the equation  $\log_{(x+3)}(6x^2 + 28x + 30) = 5 - 2\log_{(6x+10)}(x^2 + 6x + 9)$  is equal to :

[JEE Main 2026 (Online) 23rd January Evening Shift]

- (1) 1      (2) 4      (3) 0      (4) 2

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**Q.4** If the domain of the function  $f(x) = \sin^{-1}\left(\frac{5-x}{3+2x}\right) + \frac{1}{\log_e(10-x)}$  is  $(-\infty, \alpha] \cup [\beta, \gamma) - \{\delta\}$ , then  $6(\alpha + \beta + \gamma + \delta)$  is equal to

[JEE Main 2026 (Online) 22nd January Morning Shift]

- (1) 66      (2) 68      (3) 70      (4) 67

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**Q.5** Let  $f(x) = [x]^2 - [x+3] - 3$ ,  $x \in \mathbb{R}$ , where  $[\cdot]$  is the greatest integer function. Then

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1)  $f(x) = 0$  for finitely many values of  $x$   
 (2)  $f(x) < 0$  only for  $x \in [-1, 3]$   
 (3)  $\int_0^2 f(x) dx = -6$   
 (4)  $f(x) > 0$  only for  $x \in [4, \infty)$

Scan or tap for the full solution



**Q.6** Let the domain of the function

$$f(x) = \log_3 \log_5 (7 - \log_2 (x^2 - 10x + 85)) + \sin^{-1}\left(\left|\frac{3x-7}{17-x}\right|\right)$$

be  $(\alpha, \beta]$ . Then  $\alpha + \beta$  is equal to :

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) 12      (2) 8      (3) 10      (4) 9

Scan or tap for the full solution



**Q.7** The number of elements in the relation  $\text{mathrmR} = \{(x, y) : 4x^2 + y^2 < 52, x, y \in \text{mathbfZ}\}$  is

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) 86      (2) 67      (3) 89      (4) 77

Scan or tap for the full solution



**Q.8** If the range of the function  $f(x) = \frac{5-x}{x^2-3x+2}$ ,  $x \neq 1, 2$ , is  $(-\infty, \alpha] \cup [\beta, \infty)$ , then  $\alpha^2 + \beta^2$  is equal to :

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) 188      (2) 192      (3) 190      (4) 194

Scan or tap for the full solution



**Q.9** Let the domains of the functions  $f(x) = \log_4 \log_3 \log_7 (8 - \log_2 (x^2 + 4x + 5))$  and  $g(x) = \sin^{-1}\left(\frac{7x+10}{x-2}\right)$  be  $(\alpha, \beta)$  and  $[\gamma, \delta]$ , respectively. Then  $\alpha^2 + \beta^2 + \gamma^2 + \delta^2$  is equal to :

[JEE Main 2025 (Online) 4th April Evening Shift]

- (1) 15      (2) 13      (3) 16      (4) 14

Scan or tap for the full solution



**Q.10** If the domain of the function

$$f(x) = \log_e \left( \frac{2x-3}{5+4x} \right) + \sin^{-1} \left( \frac{4+3x}{2-x} \right)$$

is  $[\alpha, \beta]$ , then  $\alpha^2 + 4\beta$  is equal to

[JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) 4 (2) 3 (3) 7 (4) 5

Scan or tap for the full solution



**Q.11** If the domain of the function  $f(x) = \log_7(1 - \log_4(x^2 - 9x + 18))$  is  $(\alpha, \beta) \cup (\gamma, \delta)$ , then  $\alpha + \beta + \gamma + \delta$  is equal to

[JEE Main 2025 (Online) 3rd April Evening Shift]

- (1) 17 (2) 15 (3) 16 (4) 18

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**Q.12** Let  $A = \{1, 2, 3, \dots, 100\}$  and  $R$  be a relation on  $A$  such that  $R = \{(a, b) : a = 2b + 1\}$ . Let  $(a_1, a_2), (a_2, a_3), (a_3, a_4), \dots, (a_k, a_{k+1})$  be a sequence of  $k$  elements of  $R$  such that the second entry of an ordered pair is equal to the first entry of the next ordered pair. Then the largest integer  $k$ , for which such a sequence exists, is equal to :

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) 6 (2) 8 (3) 7 (4) 5

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**Q.13** If the domain of the function

$$f(x) = \frac{1}{\sqrt{10 + 3x - x^2}} + \frac{1}{\sqrt{x + |x|}} \text{ is } (a, b), \text{ then } (1 + a)^2 + b^2 \text{ is equal to :}$$

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) 29 (2) 30 (3) 25 (4) 26

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**Q.14** Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  be a function defined by

$$f(x) = (2 + 3a)x^2 + \left(\frac{a+2}{a-1}\right)x + b, \quad a \neq 1. \text{ If}$$

$$f(x+y) = f(x) + f(y) + 1 - \frac{2}{7}xy, \text{ then the value of}$$

$$28 \sum_{i=1}^5 |f(i)| \text{ is}$$

[JEE Main 2025 (Online) 28th January Morning Shift]

- (1) 735 (2) 675 (3) 715 (4) 545

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### Section B (Numerical) — 5 questions

**Q.15** The sum of squares of all the real solutions of the equation  $\log_{(x+1)}(2x^2 + 5x + 3) = 4 - \log_{(2x+3)}(x^2 + 2x + 1)$  is equal to \_\_\_\_\_.

[JEE Main 2026 (Online) 8th April Evening Shift]

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**Q.16** Let  $A = \{1, 4, 7\}$  and  $B = \{2, 3, 8\}$ . Then the number of elements, in the relation  $R = \{((a_1, b_1), (a_2, b_2)) \in ((A \times B) \times (A \times B)) : a_1 + b_2 \text{ divides } a_2 + b_1\}$  is \_\_\_\_\_.

[JEE Main 2026 (Online) 5th April Evening Shift]

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**Q.17** If the domain of the function

$$f(x) = \sqrt{\log_{(0.6)} \left( \left| \frac{2x-5}{x^2-4} \right| \right)}$$

is  $(-\infty, a] \cup \{b\} \cup [c, d) \cup (e, \infty)$ , then the value of  $a + b + c + d + e$  is \_\_\_\_\_.

[JEE Main 2026 (Online) 2nd April Morning Shift]

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**Q.18** Let  $A = \{2, 3, 4, 5, 6\}$ . Let  $R$  be a relation on the set  $A \times A$  given by  $(x, y)R(z, w)$  if and only if  $x$  divides  $z$  and  $y \leq w$ . Then the number of elements in  $R$  is \_\_\_\_\_.

[JEE Main 2026 (Online) 2nd April Evening Shift]

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**Q.19** Let the domain of the function  $f(x) = \cos^{-1} \left( \frac{4x+5}{3x-7} \right)$

be  $[\alpha, \beta]$  and the domain of

$$g(x) = \log_2(2 - 6\log_{27}(2x+5))$$

be  $(\gamma, \delta)$ . Then  $|7(\alpha + \beta) + 4(\gamma + \delta)|$  is equal to \_\_\_\_\_.

[JEE Main 2025 (Online) 8th April Evening Shift]

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## ANSWER KEY

### Section A (MCQ) — 14 questions

| Ques. | 1  | 2  | 3  | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|-------|----|----|----|---|---|---|---|---|---|----|----|
| Ans.  | 2  | 2  | 3  | 3 | 2 | 4 | 4 | 4 | 1 | 1  | 4  |
| Ques. | 12 | 13 | 14 |   |   |   |   |   |   |    |    |
| Ans.  | 4  | 4  | 2  |   |   |   |   |   |   |    |    |

### Section B (Numerical) — 5 questions

| Ques. | 15 | 16 | 17 | 18  | 19 |  |  |
|-------|----|----|----|-----|----|--|--|
| Ans.  | 2  | 18 | 4  | 120 | 96 |  |  |