

## Exercise – I (JEE-Main Pattern)

## SECTION–A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

*Full Marks* : +4, if only the bubble corresponding to the correct option is darkened.

*Zero Marks* : 0, if none of the bubbles is darkened.

*Negative Marks* : -1 in all other cases.

1.  $\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6+\dots}}}} =$   
 (1) 3 (2) 2 (3) 1 (4)  $\pm 3$  MFA001
2. If  $x = 8 - \sqrt{60}$ , then  $\frac{1}{2} \left[ \sqrt{x} + \frac{2}{\sqrt{x}} \right] =$   
 (1)  $\sqrt{5}$  (2)  $\sqrt{3}$  (3)  $2\sqrt{5}$  (4)  $2\sqrt{3}$  MFA002
3. If  $\frac{4+3\sqrt{5}}{4-3\sqrt{5}} = a + b\sqrt{5}$ ,  $a, b$  are rational numbers, then  $(a, b) =$   
 (1)  $\left(\frac{61}{29}, \frac{-24}{29}\right)$  (2)  $\left(\frac{-61}{29}, \frac{24}{29}\right)$  (3)  $\left(\frac{61}{29}, \frac{24}{29}\right)$  (4)  $\left(\frac{-61}{29}, \frac{-24}{29}\right)$  MFA003
4. The square root  $5+2\sqrt{6}$  is :  
 (1)  $\sqrt{3}+2$  (2)  $\sqrt{3}-\sqrt{2}$  (3)  $\sqrt{2}-\sqrt{3}$  (4)  $\sqrt{3}+\sqrt{2}$  MFA004
5. If  $\frac{4}{2+\sqrt{3}+\sqrt{7}} = \sqrt{a} + \sqrt{b} - \sqrt{c}$ , then which of the following can be true -  
 (1)  $a = 1, b = 4/3, c = 7/3$  (2)  $a = 1, b = 2/3, c = 7/9$   
 (3)  $a = 2/3, b = 1, c = 7/3$  (4)  $a = 7/9, b = 4/3, c = 1$  MFA005
6. The numerical value of  $\left(x^{1/a-b}\right)^{1/a-c} \times \left(x^{1/b-c}\right)^{1/b-a} \times \left(x^{1/c-a}\right)^{1/c-b}$  is ( $a, b, c$  are distinct real numbers)  
 (1) 1 (2) 8 (3) 0 (4) None MFA006
7.  $(2d^2e^{-1})^3 \times \left(\frac{d^3}{e}\right)^{-2} =$   
 (1)  $8e^{-2}$  (2)  $8e^{-3}$  (3)  $8e^{-1}$  (4)  $8e^{-4}$  MFA007

8. If  $a = x + \frac{1}{x}$ , then  $x^3 + x^{-3} =$   
 (1)  $a^3 + 3a$                       (2)  $a^3 - 3a$                       (3)  $a^3 + 3$                       (4)  $a^3 - 3$  **MFA008**
9. If  $(\sqrt[3]{4})^{2x+\frac{1}{2}} = \frac{1}{32}$ , then  $x =$   
 (1) -2                      (2) 4                      (3) -6                      (4) -4 **MFA009**
10. If  $(5+2\sqrt{6})^{x^2-3} + (5-2\sqrt{6})^{x^2-3} = 10$ , then all possible values of  $x$  are  
 (1) -2, 2                      (2)  $\sqrt{2}, -\sqrt{2}$                       (3) 2,  $+\sqrt{2}$                       (4) 2, -2,  $\sqrt{2}, -\sqrt{2}$  **MFA010**
11. If  $3^{2x^2} - 2.3^{x^2+x+6} + 3^{2(x+6)} = 0$  then the value of  $x$  is  
 (1) -2                      (2) 3                      (3) Both (1) and (2)                      (4) None of these **MFA011**
12. How many integers in between 100 to 1500 (both inclusive) are multiples of 5 or 11 ?  
 (1) 408                      (2) 26                      (3) 382                      (4) 380 **MFA012**
13. If  $A = \{(x, y) \mid xy = 8 \text{ and } x, y \in \mathbb{Z}\}$ , then  $n(A) =$   
 (1) 4                      (2) 8                      (3) 12                      (4) 16 **MFA013**
14. The set of all real numbers  $x$  that satisfy  $\frac{x-2}{x+2} > \frac{2x-3}{4x-1}$   
 (1)  $(-\infty, -2) \cup \left(\frac{1}{4}, \frac{3}{2}\right) \cup (2, \infty)$                       (2)  $\left(-2, \frac{1}{4}\right) \cup \left(\frac{3}{2}, 2\right)$   
 (3)  $(-\infty, -2) \cup \left(\frac{1}{4}, 1\right) \cup (4, \infty)$                       (4)  $\left(-2, \frac{1}{4}\right) \cup (1, 4)$  **MFA014**
15. The set of all real numbers  $x$  that satisfy  $\frac{x^2-4}{x^2-5x+6} \leq 0$   
 (1) [-2, 3]                      (2) [-2, 3)  
 (3)  $(-\infty, -2] \cup (3, \infty)$                       (4) None of these **MFA015**
16. If  $\frac{(x+3)^2(x-1)^9(x+1)^5}{(x-3)(x-5)^4(x-6)^5} \leq 0$ , then number of possible integral values of  $x$  is -  
 (1) 6                      (2) 3                      (3) 4                      (4) 5 **MFA016**
17. If  $(\sqrt{2}+1)^x + (\sqrt{2}-1)^x - 2\sqrt{2} = 0$ , then sum of all possible values of  $x$  is  
 (1) 0                      (2) 1                      (3) 2                      (4) 3 **MFA017**

18. If  $x^2 + y^2 + 4z^2 - 6x - 2y - 4z + 11 = 0$ , then  $xyz$  is equal to  
 (1)  $3/2$  (2) 4 (3) 6 (4) 3

MFA018

19. If  $\frac{\sqrt{3} + 4\sqrt{2}}{4\sqrt{2} - \sqrt{3}} = \frac{a + b\sqrt{6}}{c}$ , then the value of  $a + b + c$  (where  $a, b, c \in N$  and are relatively prime)  
 (1) 70 (2) 72 (3) 50 (4) 40

MFA019

20. If  $x^2 + 4y^2 + z^2 - 2xy - 2yz - zx = 0$  then  $x : y : z$  equals  
 (1) 1 : 2 : 1 (2) 2 : 1 : 2 (3) 1 : 2 : 3 (4) 1 : 1 : 2

MFA020

SECTION-B

- This section contains **TEN** Questions. Attempt any five Questions. First five Questions Attempt will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct).
- Answer to each question will be evaluated according to the following marking scheme:  
*Full Marks* : +4, if **ONLY** the correct numerical value is entered as answer.  
*Zero Marks* : 0 in all other cases.

1. If  $a - \frac{1}{a} = \frac{1}{2}$  then  $\left(4a^2 + \frac{4}{a^2}\right)$  is equal to

MFA021

2. If polynomial  $Ax^3 + 4x^2 + Bx + 5$  leaves same remainder, when divided by  $x - 1$  and  $x + 2$  respectively then value of  $3A + B$  is equal to

MFA022

3. If  $9^x + 6^x = 2.4^x$  then the value of  $\frac{x^3 + 64}{5}$

MFA023

4. If  $a + b + c = 6$  &  $a^2 + b^2 + c^2 = 14$  and  $a^3 + b^3 + c^3 = 36$  then the value of  $3\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

MFA024

5. If  $x + y + z = 12$  &  $x^2 + y^2 + z^2 = 96$  and  $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 36$ . Find the value of  $\frac{x^3 + y^3 + z^3}{4}$

MFA025

6. If  $x = \sqrt{4 - 2\sqrt{3}}$  and  $y = \sqrt{9 - 4\sqrt{5}}$  then the value of  $(\sqrt{5}x - \sqrt{3}y)^2$  is equal to  $(a - b\sqrt{c})$  where  $a, b, c$  are coprime numbers then  $a + b + c$  is equal to (where 'c' is an odd integer)

MFA026

7. If  $x, y, z \in R$  and  $121x^2 + 4y^2 + 9z^2 - 22x + 4y + 6z + 3 = 0$  then value of  $x^{-1} - y^{-1} - z^{-1}$  is equal to

MFA027

8. If  $\frac{p}{q} = \frac{x+2}{x-2}$ , then find the value of  $\frac{p^2 - q^2}{p^2 + q^2} \times \frac{x^2 + 4}{x}$ . ( $x \neq 0$ )

**MFA028**

9.  $\frac{3x + \sqrt{9x^2 - 5}}{3x - \sqrt{9x^2 - 5}} = 5$  find 'x'

**MFA029**

10. Value of  $\left( \frac{\sqrt{6}}{\sqrt{3} - \sqrt{2} + \frac{\sqrt{6}}{\sqrt{3} - \sqrt{2} + \frac{\sqrt{6}}{(\sqrt{3} - \sqrt{2}) + \dots}}}} \right)^2$  is

**MFA030**

## Exercise – II (JEE-Main &amp; JEE Advanced PYQs)

1. The expression  $\frac{12}{3+\sqrt{5}+2\sqrt{2}}$  is equal to  
 (A)  $1-\sqrt{5}+\sqrt{2}+\sqrt{10}$  (B)  $1+\sqrt{5}+\sqrt{2}-\sqrt{10}$   
 (C)  $1+\sqrt{5}-\sqrt{2}+\sqrt{10}$  (D)  $1-\sqrt{5}-\sqrt{2}+\sqrt{10}$  MFA031
2. If  $x < 0, y < 0, x + y + \frac{x}{y} = \frac{1}{2}$  and  $(x + y) \frac{x}{y} = -\frac{1}{2}$ , then  $x = \dots$  and  $y = \dots$  MFA032
3. The equation  $x - \frac{2}{x-1} = 1 - \frac{2}{x-1}$  has  
 (A) no root (B) one root (C) two equal roots (D) infinitely many roots MFA033
4. Find all real values of  $x$  which satisfy  $x^2 - 3x + 2 > 0$  and  $x^2 - 2x - 4 \leq 0$ . MFA034
5. Find the set of all  $x$  for which  $\frac{2x}{(2x^2+5x+2)} > \frac{1}{(x+1)}$ . MFA035
6. The sum of all real roots of the equation  $|x - 2|^2 + |x - 2| - 2 = 0$  is ... MFA036
7. The number of real solutions of the equation  $|x|^2 - 3|x| + 2 = 0$  is  
 (A) 4 (B) 1 (C) 2 (D) 3 MFA037
8. If  $S$  is the set of all real  $x$  such that  $\frac{2x-1}{2x^3+3x^2+x}$  is positive, then  $S$  contains  
 (A)  $\left(-\infty, -\frac{3}{2}\right)$  (B)  $\left(-\frac{3}{2}, -\frac{1}{4}\right)$  (C)  $\left(-\frac{1}{4}, \frac{1}{2}\right)$  (D)  $\left(\frac{1}{2}, 3\right)$  MFA038
9. Let  $y = \sqrt{\frac{(x+1)(x-3)}{(x-2)}}$   
 Find all the real values of  $x$  for which  $y$  takes real values. MFA039
10. The sum of the solutions of the equation  $|\sqrt{x} - 2| + \sqrt{x}(\sqrt{x} - 4) + 2 = 0, (x > 0)$  is equal to:  
 (1) 4 (2) 9 (3) 10 (4) 12 [JEE Main 2019]  
MFA040

11. Let S be the set of all real roots of the equation,  $3^x(3^x - 1) + 2 = |3^x - 1| + |3^x - 2|$ . Then S : [JEE Main 2020]  
 (1) is an empty set.  
 (2) contains at least four elements.  
 (3) contains exactly two elements.  
 (4) is a singleton. MFA041
12. The product of the roots of the equation  $9x^2 - 18|x| + 5 = 0$ , is [JEE Main 2020]  
 (1)  $\frac{25}{9}$                       (2)  $\frac{25}{81}$                       (3)  $\frac{5}{27}$                       (4)  $\frac{5}{9}$  MFA042
13. The number of real roots of the equation,  $e^{4x} + e^{3x} - 4e^{2x} + e^x + 1 = 0$  is : [JEE Main 2020]  
 (1) 4                      (2) 2                      (3) 3                      (4) 1 MFA043
14. The number of real roots of the equation  $e^{4x} - e^{3x} - 4e^{2x} - e^x + 1 = 0$  is equal to \_\_\_\_ . [JEE Main 2021]  
MFA044
15. The number of the real roots of the equation  $(x + 1)^2 + |x - 5| = \frac{27}{4}$  is \_\_\_\_\_. [JEE Main 2021]  
MFA045
16. The number of real solutions of the equation,  $x^2 - |x| - 12 = 0$  is: [JEE Main 2021]  
 (1) 2                      (2) 3                      (3) 1                      (4) 4 MFA046
17. The number of real solutions of the equation  $e^{4x} + 4e^{3x} - 58e^{2x} + 4e^x + 1 = 0$  is \_\_\_\_\_. [JEE Main 2022]  
MFA047
18. The sum of all the roots of the equation  $|x^2 - 8x + 15| - 2x + 7 = 0$  is: [JEE Main 2023]  
 (1)  $9 + \sqrt{3}$                       (2)  $11 + \sqrt{3}$                       (3)  $9 - \sqrt{3}$                       (4)  $11 - \sqrt{3}$  MFA048
19. The number of real roots of the equation  $x|x| - 5|x + 2| + 6 = 0$ , is [JEE Main 2023]  
 (1) 5                      (2) 3                      (3) 6                      (4) 4 MFA049

20. The number of real solutions of the equation  $3\left(x^2 + \frac{1}{x^2}\right) - 2\left(x + \frac{1}{x}\right) + 5 = 0$ , is

[JEE Main 2023]

(1) 4

(2) 0

(3) 3

(4) 2

MFA050

21. The number of points, where the curve  $f(x) = e^{8x} - e^{6x} - 3e^{4x} - e^{2x} + 1$ ,  $x \in \mathbb{R}$  cuts  $x$ -axis, is equal to

[JEE Main 2023]

MFA051

**ANSWER KEY**

**Exercise - I (JEE - Main Pattern)**

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	1	1	4	4	1	1	3	2	4	4
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	3	3	2	3	4	4	1	1	2	2
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	9.00	4	12.80	5.5	216.50	36	16	4	1	2

**Exercise - II (JEE-Main + JEE Advanced PYQs)**

Question	1	2	3	4	5	
Answer	B	$x = -\frac{1}{4}, y = -\frac{1}{4}$	A	$x \in [1 - \sqrt{5}, 1) \cup (2, 1 + \sqrt{5}]$	$(-2, -1) \cup \left(-\frac{2}{3}, -\frac{1}{2}\right)$	
Question	6	7	8	9	10	
Answer	4	A	A,D	$x \in [-1, 2) \cup [3, \infty)$	3	
Question	11	12	13	14	15	
Answer	4	2	4	2	2	
Question	16	17	18	19	20	
Answer	1	2	1	2	2	
Question	21					
Answer	2					