1. Domain of definition of the function

$f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x)$, is- **[AIEEE 2003]**

(1) $(-1, 0) \cup (1, 2) \cup (2, \infty)$
(2) $(1, 2)$
(3) $(-1, 0) \cup (1, 2)$
(4) $(1, 2) \cup (2, \infty)$

2. If $f : R \to R$ satisfies $f(x + y) = f(x) + f(y)$, for all $x, y \in R$ and $f(1) = 7$, then $\sum_{r=1}^{n} f(r)$ is - **[AIEEE 2003]**

(1) $\frac{7n(n+1)}{2}$ (2) $\frac{7n}{2}$

(3) $\frac{7(n+1)}{2}$ (4) $7n(n + 1)$

3. A function f from the set of natural numbers to integers defined by $f(n) = \begin{cases} \frac{n-1}{2}, & \text{when n is odd} \\ -\frac{n}{2}, & \text{when n is even} \end{cases}$ is- **[AIEEE 2003]**

(1) neither one-one nor onto
(2) one-one but not onto
(3) onto but not one-one
(4) one-one and onto both

4. The range of the function $f(x) = {}^{7-x}P_{x-3}$ is- **[AIEEE-2004]**

(1) {1, 2, 3, 4, 5} (2) {1, 2, 3, 4, 5, 6}
(3) {1, 2, 3} (4) {1, 2, 3, 4}

5. If $f : R \to S$ defined by $f(x) = \sin x - \sqrt{3}\cos x + 1$ is onto, then the interval of S is- **[AIEEE-2004]**

(1) $[-1, 3]$ (2) $[-1, 1]$
(3) $[0, 1]$ (4) $[0, -1]$

6. A real valued function $f(x)$ satisfies the function equation $f(x - y) = f(x)f(y) - f(a - x)f(a + y)$ where a is a given constant and $f(0) = 1$, $f(2a - x)$ is equal to **[AIEEE-2005]**

(1) $f(1) + f(a - x)$ (2) $f(-x)$
(3) $-f(x)$ (4) $f(x)$

7. If x is real, the maximum value of $\frac{3x^2 + 9x + 17}{3x^2 + 9x + 7}$ is- **[AIEEE 2006]**

(1) 41 (2) 1 (3) $\frac{17}{7}$ (4) $\frac{1}{4}$

8. The largest internal lying in $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ for which the function

$f(x) = 4^{-x^2} + \cos^{-1}\left(\frac{x}{2} - 1\right) + \log(\cos x)$ is defined, is **[AIEEE - 2007]**

(1) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (2) $\left[-\frac{\pi}{4}, \frac{\pi}{2}\right)$

(3) $\left[0, \frac{\pi}{2}\right)$ (4) $[0, \pi]$

9. Let $f : N \to Y$ be a function defined as $f(x) = 4x + 3$ where $Y = \{y \in N : y = 4x + 3 \text{ for some } x \in N\}$. So that f is invertible and its inverse is **[AIEEE - 2008]**

(1) $g(y) = \frac{3y + 4}{3}$ (2) $g(y) = 4 + \frac{y + 3}{4}$

(3) $g(y) = \frac{y + 3}{4}$ (4) $g(y) = \frac{y - 3}{4}$

10. For real x, let $f(x) = x^3 + 5x + 1$, then :- **[AIEEE - 2009]**

(1) f is one-one and onto R
(2) f is neither one-one nor onto R
(3) f is one-one but not onto R
(4) f is onto R but not one-one

11. The domain of the function $f(x) = \frac{1}{\sqrt{|x| - x}}$ is:- **[AIEEE - 2011]**

(1) $(-\infty, 0)$ (2) $(-\infty, \infty) - \{0\}$
(3) $(-\infty, \infty)$ (4) $(0, \infty)$

12. The range of the function $f(x) = \frac{x}{1 + |x|}, x \in R$, is **[AIEEE-2012(Online)]**

(1) $[-1, 1]$ (2) R
(3) R – {0} (4) $(-1, 1)$

13. If P(S) denotes the set of all subsets of a given set S, then the number of one – to – one functions from the set S = {1, 2, 3} to the set P(S) is

[AIEEE-2012(Online)]

(1) 24 (2) 8
(3) 336 (4) 320

14. Let A = {1, 2, 3, 4} and R : A → A be the relation defined by :
R = {(1, 1), (2, 3), (3, 4) (4, 2) }. The correct statement is : **[JEE(Main)-2013(Online)]**

(1) R is an onto function.

(2) R is not a function

(3) R is not a one to one function

(4) R does not have an inverse.

15. The least integral value α of x such that

$\frac{x-5}{x^2+5x-14} > 0$, satisfies

[JEE(Main)-2013(Online)]

(1) $\alpha^2 - 7\alpha + 6 = 0$ (2) $\alpha^2 + 3\alpha - 4 = 0$
(3) $\alpha^2 + 5\alpha - 6 = 0$ (4) $\alpha^2 - 5\alpha + 4 = 0$

16. If $a \in R$ and the equation $-3(x - [x])^2 + 2(x - [x]) + a^2 = 0$ (where [x] deontes the greatest integer $\le x$) has no integral solution, then all possible values of a lie in the interval : **[JEE(Main)-2014]**

(1) $(-1, 0) \cup (0, 1)$ (2) (1, 2)
(3) (–2, –1) (4) $(-\infty, -2) \cup (2, \infty)$

17. If $f(x) + 2f\left(\frac{1}{x}\right) = 3x$, $x \neq 0$, and

$S = \{x \in R : f(x) = f(-x)\}$; then S : **[JEE(Main)-2016]**

(1) contains more than two elements.
(2) is an empty set.
(3) contains exactly one element
(4) contains exactly two elements

18. The function $f : R \to \left[-\frac{1}{2}, \frac{1}{2}\right]$ defined as

$f(x) = \frac{x}{1+x^2}$, is : **[JEE(Main)-2017]**

(1) neither injective nor surjective.
(2) invertible.
(3) injective but not surjective.
(4) surjective but not injective

19. Let $S = \{x \in R : x \ge 0$ and

$2|\sqrt{x} - 3| + \sqrt{x}(\sqrt{x} - 6) + 6 = 0\}$.

Then S : **[JEE(Main)-2018]**

(1) contains exactly one element.
(2) contains exactly two elements.
(3) contains exactly four elements.
(4) is an empty set.

20. Let $f(x) = \frac{\alpha x}{x+1}$, $x \neq -1$. Then for what value of α is $f(f(x)) = x$?

[IIT 2001 (Scr.)]

(1) $\sqrt{2}$ (2) $-\sqrt{2}$ (3) 1 (4) – 1.

21. Suppose $f(x) = (x + 1)^2$ for $x \ge -1$. If g(x) is the function whose graph is the reflection of the graph of f(x) with respect to the line y = x, then g(x) equals- **[IIT 2002 (Scr.)]**

(1) $-\sqrt{x} - 1$, $x \ge 0$ (2) $\frac{1}{(1+x)^2}$, $x \ge -1$

(3) $\sqrt{x+1}$, $x \ge -1$ (4) $\sqrt{x} - 1$, $x \ge 0$

22. Let function $f : R \to R$ be defined by $f(x) = 2x + \sin x$ for $x \in R$. Then f is - **[IIT 2002 (Scr.)]**

(1) one to one and onto
(2) one to one but not onto
(3) onto but not one to one
(4) neither one to one nor onto

23. Range of the function $f(x) = \frac{x^2+x+2}{x^2+x+1}$ is - **[IIT 2003 (Scr.)]**

(1) [1, 2] (2) $[1, \infty)$

(3) $\left[2, \frac{7}{3}\right]$ (4) $\left(1, \frac{7}{3}\right]$

24. Let $f(x) = \frac{x}{1+x}$ defined from $(0, \infty) \to [0, \infty)$, then by f(x) is - **[IIT 2004 (Scr.)]**

(1) one-one but not onto
(2) one-one and onto
(3) Many one but not onto
(4) Many one and onto

25. Let f(x) = sinx + cosx, g(x) = x^2-1. Thus g(f(x)) is invertible for x ∈ **[IIT 2004 (Scr.)]**

(1) $\left[-\frac{\pi}{2},0\right]$ (2) $\left[-\frac{\pi}{2},\pi\right]$

(3) $\left[-\frac{\pi}{4},\frac{\pi}{4}\right]$ (4) $\left[0,\frac{\pi}{2}\right]$

26. If functions f (x) and g (x) are defined on R → R such that

$$f(x)=\begin{cases}0, & x\in \text{rational}\\ x, & x\in \text{irrational}\end{cases},$$

$$g(x)=\begin{cases}0, & x\in \text{irrational}\\ x, & x\in \text{rational}\end{cases}$$, then (f – g) (x) is -

(1) one-one and onto **[IIT 2005 (Scr.)]**
(2) neither one-one nor onto
(3) one-one but not onto
(4) onto but not one-one

27. Let f(x) = x^2 and g(x) = sinx for all x∈R. Then the set of all x satisfying
(f o g o g o f) (x) = (g o g o f) (x),
where (f o g) (x) = f(g(x)), is-
[IIT 2011]

(1) $\pm\sqrt{n\pi}, n\in\{0,1,2,....\}$

(2) $\pm\sqrt{n\pi}, n\in\{1,2,...\}$

(3) $\frac{\pi}{2}+2n\pi, n\in\{....,-2,-1,0,1,2,.....\}$

(4) $2n\pi, n\in\{....,-2,-1,0,1,2,.....\}$

28. The function f : [0,3] → [1,29], defined by f(x) = $2x^3 - 15x^2 + 36x + 1$, is : **[IIT 2012]**
(1) one-one and onto
(2) onto but not one-one
(3) one-one but not onto
(4) neither one-one nor onto

***29.** Let f : (–1,1) → IR be such that

$$f(\cos 4\theta)=\frac{2}{2-\sec^2\theta} \text{ for } \theta\in\left(0,\frac{\pi}{4}\right)\cup\left(\frac{\pi}{4},\frac{\pi}{2}\right).$$

Then the value(s) of $f\left(\frac{1}{3}\right)$ is (are) - **[IIT 2012]**

(1) $1-\sqrt{\frac{3}{2}}$ (2) $1+\sqrt{\frac{3}{2}}$

(3) $1-\sqrt{\frac{2}{3}}$ (4) $1+\sqrt{\frac{2}{3}}$

***30.** Let $f:\left(-\frac{\pi}{2},\frac{\pi}{2}\right)\to\mathbb{R}$ be given by

f(x) = (log (sec x + tan x))^3 Then
[JEE(Advanced)-2014]

(1) f(x) is an odd function
(2) f(x) is a one-one function
(3) f(x) is an onto function
(4) f(x) is an even function

*** Marked Questions are multiple answer**

PREVIOUS YEARS QUESTIONS				ANSWER KEY						Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**1**	**1**	**4**	**3**	**1**	**3**	**1**	**3**	**4**	**1**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**1**	**4**	**3**	**1**	**3**	**1**	**4**	**4**	**4**	**4**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**4**	**1**	**4**	**1**	**3**	**1**	**1**	**2**	**1,2(Bonus)**	**1,2,3**