1. FUNCTIONS

1. Find the domain of the real valued function $f(x)=\left([x]^2-[x]-2\right)^{-1/2}$, where [.] is the greatest integer function

[AP EAMCET 17-09-20_Shift-1]

1. $R-(-1,3]$ 2. $R-[-1,3)$
3. $R-(-1,3)$ 4. $R-[-1,3]$

2. How many bijections $f:Z\to Z$ are there such that $f(x+y)=f(x)+f(y)$ for all $x,y\in Z$?

[AP EAMCET 17-09-20_Shift-1]

1. One 2. Two
3. Three 4. Infinitely many

3. The domain of

$$f(x)=\text{Cos}^{-1}\left(\frac{x-3}{2}\right)-\log_{10}(4-x)$$ is ____

[AP EAMCET 17-09-20_Shift-1]

1. (1, 4) 2. [1, 4)
3. (1, 4] 4. [1, 4]

4. *The function* $f:R\to R$ *defined by*

$$f(x)=\frac{x}{\sqrt{1+x^2}}$$ *is* ________

[AP EAMCET 17-09-20_Shift-2]

1. Surjective but not injective
2. Bijective
3. Injective but not surjective
4. Neither injective nor surjective

5. For $f(x)=\frac{\sin\pi[x]}{1+[x]}+\frac{x}{2+3x}$, where $[x]$ denotes the greatest integer function, the domain and range in R are respectively

[AP EAMCET 17-09-20_Shift-2]

1. $R-\left\{-1,\frac{-2}{3}\right\}$ & $R-\left\{\frac{1}{3}\right\}$
2. $R-\left\{-1,\frac{-2}{3}\right\}$ & $[-1,1]$
3. $R-[-1,0)$ & $R-\left\{\frac{1}{3}\right\}$
4. $R-[-1,0)$ & $[-1,1]$

6. How many functions $f:Z\to Z$ are there such that $f(x+y)=f(x)+f(y)$ for all $x,y\in Z$?

[AP EAMCET 17-09-20_Shift-2]

1. 1 2. 2
3. 3 4. Infinitely many

7. Find $\sum_{t=1}^{39}f(t)$ if $f:R\to R$ is defined as $f(x+y)=f(x)+f(y),x,y\in R$ and $f(1)=7$ **[AP EAMCET 18-09-20_Shift-1]**

1. 5187 2. 5460
3. 5740 4. 5407

8. Find the function $g(t)$ if $f(t)=3t-2$ and $(gof)^{-1}(t)=t-2$

[AP EAMCET 18-09-20_Shift-1]

1. $g(t)=\frac{(t-8)}{3}$ 2. $g(t)=\frac{(t+8)}{3}$
3. $g(t)=\frac{(8-t)}{3}$ 4. $g(t)=3t-8$

9. If $f:R\to R$ is defined by $f(x)=\frac{x^6}{x^6+2020},\forall\ x\in R,$ then the range of f is

[AP EAMCET 18-09-20_Shift-2]

1. $[0,1]$ 2. $[0,\infty)$
3. $[0,1)$ 4. $\left[0,\frac{1}{2020}\right)$

10. Exactly how many functions $f:Q\to Q$ exist such that $f(x+y)=f(x)+f(y)$ and $f(xy)=f(x)f(y)$ for all $x,y\in Q$?

[AP EAMCET 18-09-20_Shift-2]

1. one 2. two
3. three 4. Infinitely many

11. If $f:R\to R$ is defined as $f(x)=\frac{2020^x}{2020^x+\sqrt{2020}},\forall x\in R$ then $\sum_{r=1}^{4039}2f\left(\frac{r}{4040}\right)=$

[AP EAMCET 21-09-20_Shift-1]

1. 4040 2. 4039
3. 2020 4. 1010

12. If $f(x)=e^x$; $g(x)=\ln(x)$ for all $x\in[1,\infty)$, then fog is ____

[AP EAMCET 21-09-20_Shift-1]

1. A one-one function 2. An onto function
3. Not a function 4. Bijective

13. The domain of $\sqrt{|x|-x}$ is

[AP EAMCET 21-09-20_Shift-2]

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

14. Let S be a finite set, then a non-identity function $f:S\to S$ can be ………

[AP EAMCET 21-09-20_Shift-2]

1. Injective but not surjective
2. Surjective but not injective
3. Bijective but it does not have an inverse function
4. Data insufficient

15. If $(f(x))^2=f(x^2)+f(1)$ holds good, then find $f(x)$ [AP EAMCET 21-09-20_Shift-2]

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

16. For equality of functions f and g
i) domain of f = domain of g
ii) f(x)=g(x)
iii) x belongs to domain of f

[AP EAMCET 22-09-20_Shift-1]

1. Only (i) and (ii) are necessary
2. Only (ii) and (iii) are necessary
3. Only (i) and (iii) are necessary
4. All (i),(ii),(iii) are necessary

17. Let $f:N\times N\to N$ be a function such that f((1,1))=2 and f((m+1,n))=f((m,n))+2(m+n) and f((m,n+1)=f((m,n)+2(m+n-1), for all m,n $\in$ N, then find f(2,2).

[AP EAMCET 22-09-20_Shift-1]

1. 8 2. 7
3. 9 4. 10

18. For $f(x)=\sin\left(\frac{1}{|x|\sqrt{x^2-1}}\right)$ the domain and range of $f(x)$ in R are

[AP EAMCET 22-09-20_Shift-1]

1. $R-\{0,\pm1\}$ *and* $[-1,1]$, *respectively*
2. $R-[-1,1]$ *and* $[-1,1]$, *respectively*
3. $R-\{0,\pm1\}$ *and* $[0,1]$, *respectively*
4. $R-[-1,1]$ *and* $[0,1]$, *respectively*

19. The range of the function $f(x)=x^2+\frac{1}{x^2+1}$ is

[AP EAMCET 22-09-20_Shift-1]

1. $[1,\infty)$ 2. $[2,\infty)$
3. $\left[\frac{3}{2},\infty\right)$ 4. $(0,1]$

20. The function $f(x)=sinx\ -cosx$ is________

[AP EAMCET 22-09-20_Shift-2]

1. Odd function
2. Even function
3. Neither even nor odd function
4. f(x) is not a function

21. If $f:N\times N\to N$ is defined by $f((m,n))=2^{m-1}(2n-1),\forall(m,n)\in N\times N$ then f is [AP EAMCET 22-09-20_Shift-2]

1. One-one but not onto
2. Onto but not one-one
3. Neither one-one nor onto
4. Both one-one and onto

22. In the following statements ________
(i) Relation is a special case of function
(ii) Function is special case of relation
(iii) Both relation & function are same

[AP EAMCET 23-09-20_Shift-1]

1. (iii) is True, (i) & (ii) are false
2. (i) is True, (ii) & (iii) are false
3. (ii) is True, (i) & (iii) are false
4. All (i), (ii) & (iii) are true

23. If $f:R\to R$ is defined as $f(x)=x-[x]+3,\ \forall x\in R$, then f is

[AP EAMCET 23-09-20_Shift-1]

1. Not a function
2. A periodic function with period π
3. A periodic function with period 1
4. An invertible function

24. If f: R→R is defined as f(x)= $\left(2020-x^{2019}\right)^{1/2019}$, $\forall x\in R$, find (fofofof) ($\frac{2019}{2020}$)

[AP EAMCET 23-09-20_Shift-1]

1. 1
2. 0
3. $\frac{2019}{2020}$
4. $\frac{2020}{2019}$

25. If f is a continuous real valued function , then the range of the function is

[AP EAMCET 23-09-20 Shift-1]

1. [0,1]
2. [Minimum(f), Maximum(f)]
3. [0, ∞)
4. (-∞ ,0]

26. *The function* $f(x)=\frac{e^{|x|}-e^{-x}}{e^{x}+e^{-x}}+\cos^{3}\left(\frac{x}{2}\right)$ *from R to itself is*

1. An injective function
2. A surjective function
3. An even function
4. No bijective

27. Let A={1,2,3,…n} and B={a,b} if the number of onto functions from A to B is 62,then the number of subsets of A containing exactly three elements is

1. 15
2. 6
3. 20
4. 10

28. Match the items of List-I with those of the items of List-II

LIST-I	LIST-II
A) Range of $\sec^{-1}\left[1+\cos^2 x\right]$, [.] denotes the greatest integer function	(I) Odd function
B)Domain of $f(x)$, where $f\left(x+\frac{1}{x}\right)=x^2+\frac{1}{x^2}$	(II) $\left\{0,\frac{1}{2}\right\}$
C) $f(x+y)=f(x)+f(y); f(1)=5$	(III) $\left\{\sec^{-1}5,\sec^{-1}4\right\}$
D) $\sin^{-1}x-\cos^{-1}x+\sin^{-1}(1-x)=0 \Rightarrow x\in$	(IV) $R-(-2,2)$
	(V) $\left\{\sec^{-1}1,\sec^{-1}2\right\}$

The correct match is

[TS EAMCET 09-09-20_Shift-1]

1. A-V, B-IV, C-I, D-II
2. A-III, B-IV, C-II, D-I
3. A-V, B-II, C-III, D-IV
4. A-III, B-II, C-I, D-IV

29. The domain of the function $f(x)=\sec^{-1}(3x-4)+\tanh^{-1}\left(\frac{x+3}{5}\right)$ is

[TS EAMCET 09-09-20_Shift-1]

1. $(-8,1)\cup\left(\frac{5}{3},2\right)$
2. $\left(1,\frac{5}{3}\right)$
3. $[-8,1]\cup\left[\frac{5}{3},2\right]$
4. $(-8,1]\cup\left[\frac{5}{3},2\right)$

30. The function $f:R\to R$ defined by $f(x)=\frac{x}{\sqrt{1+x^2}}$ is

[TS EAMCET 09-09-20_Shift-2]

1. surjective but not injective
2. bijective
3. injective but not surjective
4. neither injective nor surjective

31. The set of values of α such that $f:R\to\left[0,\frac{\pi}{2}\right)$ defined by $f(x)=\tan^{-1}\left(x^2+x+\alpha^2\right)$ is onto is

[TS EAMCET 09-09-20_Shift-2]

1. $\left(\frac{-1}{2},\frac{1}{2}\right)$
2. $\left(\frac{-1}{4},\frac{1}{4}\right)$
3. $\left(-\infty,\frac{-1}{2}\right)\cup\left(\frac{1}{2},a\right)$
4. $\left(-\infty,\frac{-1}{4}\right)\cup\left(\frac{1}{4},\infty\right)$

32. Let $f:[0,10]\to[1,20]$ be a function defined as $f(x)=\begin{cases}\frac{60-5x}{3}, & 0\le x\le 6\\ 10, & 6\le x\le 7\\ 31-3x, & 7\le x\le 10\end{cases}$ then f is

[TS EAMCET 10-09-20_Shift-1]

1. bijective function
2. one-one but not onto function
3. onto but not one –one function
4. neither one-one nor onto function

33. The domain of the function $f(x)=\sqrt{\log_{10}\left(\frac{5x-x^2}{4}\right)}$ is

[TS EAMCET 10-09-20_Shift-1]

1. $[0,1]$ 2. $[1,4]$
3. $[4,5]$ 4. $(-\infty,\infty)$

34. If $f(x)=x-\frac{1}{x}, x\neq 0$, then $3f(x)=$

[TS EAMCET 10-09-20_Shift-2]

1. $3[f(x)]^2-f(x^2)$ 2. $[f(x)]^2-f(x^3)$
3. $f(x^3)-[f(x)]^3$ 4. $f(x^3)-f(x^2)$

35. Let [.] denote greatest integer function. If $f(x)=[x]$ and $g(x)=3\left[\frac{x}{3}\right]$, then the set of all real x such that f(x)=g(x) is

[TS EAMCET 10-09-20_Shift-2]

1. R
2. $\{x\in R/x=3k, k\in Z\}$
3. $\{x\in R/3k-1<x\leq 3k, k\in Z\}$
4. $\{x\in R/3k\leq x<3k+1, k\in Z\}$

36. If $f:[-3,2]\to\left[0,\sqrt[3]{x}\right]$ is an onto function defined by $f(n)=\begin{cases}2+\sqrt[3]{n}, & -3\leq n\leq -1\\ n^{\frac{2}{3}}, & -1\leq n\leq 2\end{cases}$ then $x=$

[TS EAMCET 11-09-20_Shift-1]

1. 1 2. 2
3. 4 4. 6

37. Let $[x]$ denote the greatest integer not more than x. If A and B are the domains of the functions $f(x)=\frac{x-[x]}{\sqrt{|x|-x}}$ and $g(x)=\frac{x-[x]}{\sqrt{|x|+x}}$ respectively, then

[TS EAMCET 11-09-20_Shift-1]

1. $A\cup B=R$ 2. $A\cap B=\phi$
3. $A-B=(-\infty,0)$ 4. $B-A=(0,\infty)$

38. The number of bijective functions $f:Z\to Z$ such that $f(x+y)=f(x)+f(y)\forall x,y\in Z$, is

[TS EAMCET 11-09-20_Shift-2]

1. 2 2. 4
3. 0 4. Infinitely many

39. For each $n\in N$, let $A_n=\{(n+1)k/k\in N\}$ and $X=\bigcup_{n\in N}A_n$. A mapping $f:X\to N$ defined by $f(x)=x,\forall x\in X$ is

[TS EAMCET 11-09-20_Shift-2]

1. one-one and onto
2. one-one but not onto
3. onto but not one-one
4. neither one-one nor onto

40. Given that for any $n\in N$ there exist on odd integer q and a non-negative integer r such that, n can be written uniquely as $n=q\times 2^r$. Let $f:N\to N\times N$ be function defined by $f(n)=\left(r+1,\frac{q+1}{2}\right)$. Then,

[TS EAMCET 14-09-20_Shift-1]

1. f is one-one but not onto
2. f is onto but not one-one
3. f is bijection
4. only $f^{-1}(1,1)$ does not exist because f is not a bijection.

41. If $f:R\to R$ be defined by $f(x)=x+2|x+1|+2|x-1|$, then the element in the codomain, which has unique pre image in the domain is

[TS EAMCET 14-09-20_Shift-1]

1. 3 2. 1
3. 2 4. 5

42. For $n\in N$, if $f(n)=(\cos nx)(\sec x)^n$ And $g(n)=(\sin nx)(\sec x)^n$, then $f(2020)-f(2019)+(\tan x)g(2019)=$

[TS EAMCET 14-09-20_Shift-1]

1. $\sin x$ 2. $\cos x$
3. 0 4. 1

43. If $f: Z \to N$ is defined by

$$f(n)=\begin{cases}2n, & if \ n>0 \\ 1, & if \ n=0 \\ -2n-1 & if \ n<0\end{cases}$$ then f is

[TS EAMCET 14-09-20_Shift-2]

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

44. Domain of $\cos^{-1}\left[\log_5\left(x^2+7x+15\right)\right]$ is

[TS EAMCET 14-09-20_Shift-2]

1. The set of all real numbers
2. $(-\infty,-5]\cup[-2,\infty)$
3. $R-\{-5,-2\}$, where R is the set of real numbers
4. $[-5,-2]$

45. Let $f(n)=A(-2)^n+B(-3)^n \ \forall A.B\in R$ and $n\in N-\{1,2\}$. If $f(n)+af(n-1)+bf(n-2)=0$, then $(a+b)(b-a)=$

[TS EAMCET 14-09-20_Shift-2]

1. 0
2. 5
3. 7
4. 11

46. Let $f: R\to R$ and $g: R\to R$ be defined by $f(x)=2x+1$ & $g(x)=x^2-2$ determine $(gof)(x)=$

[AP EAMCET 19-08-2021_Shift-1]

1. $2x^2-3$
2. $4x^2+4x-1$
3. $4x^2+4x+1$
4. $2x^2-4$

47. Given the function $f(x)=\dfrac{a^x+a^{-x}}{2},(a>2)$ then $f(x+y)+f(x-y)$ is equal to

[AP EAMCET 19-08-2021_Shift-1]

1. $f(x)-f(y)$
2. $f(y)$
3. $2f(x)f(y)$
4. $f(x)f(y)$

48. If f is a function define on $(0,1)$ by $f(x)=\min\{x-[x],-x-[x]\}$ then $(fofofof)(x)=$ __ ([.] greatest integer function) **[AP EAMCET 19-08-2021_Shift-1]**

1. x
2. $-x$
3. $4x$
4. $2x$

49. The real valued function $f(x)=\dfrac{x}{e^x-1}+\dfrac{x}{2}+1$ defined on $R\setminus\{0\}$ is

[AP EAMCET 19-08-2021_Shift-2]

1. An odd function
2. An even function
3. Both even& odd function
4. Neither even nor odd function

50. The domain of the function $f(x)=\dfrac{1}{[x]-1}$, where $[x]$ is the greatest integer function of x is **[AP EAMCET 19-08-2021_Shift-2]**

1. $R-(1,2)$
2. $R-\{1\}$
3. $R-\{0,1\}$
4. $R-[1,2)$

51. Let $f: R\to R$ be a function defined by $f(x)=\dfrac{4^x}{4^x+2}$, what is the value of $f\left(\dfrac{1}{4}\right)+2f\left(\dfrac{1}{2}\right)+f\left(\dfrac{3}{4}\right)=?$

[AP EAMCET 19-08-2021_Shift-2]

1. 4
2. 3
3. 2
4. 1

52. $f(x)=\sin x+\cos x, g(x)=x^2-1$ then $g(f(x))$ is invertible if

[AP EAMCET 20-08-2021_Shift-1]

1. $\dfrac{-\pi}{4}\le x\le\dfrac{\pi}{4}$
2. $-\dfrac{\pi}{2}\le x\le 0$
3. $\dfrac{-\pi}{2}\le x\le \pi$
4. $0\le x\le\dfrac{\pi}{2}$

53. If $f : z \to z$ is defined by
$f(x) = x^9 - 11x^8 - 2x^7 + 22x^6 + x^4 - 12x^3 + 11x^2 + x - 3$
$\forall x \in z$, then $f(11) =$

[AP EAMCET 20-08-2021_Shift-1]

1. 7 2. 8
3. 6 4. 9

54. Let $f(x) = x^3$ and $g(x) = 3^x$, then the quadratic equation whose roots are solutions of the equation $(fog)(x) = (gof)(x)$ $(for\ x \neq 0)$ is

[AP EAMCET 20-08-2021_Shift-1]

1. $x^2 - 6x + 3 = 0$ 2. $x^2 - 6x + 9 = 0$
3. $x^2 - x + 3 = 0$ 4. $x^2 - 3 = 0$

55. Let $f(x) = (x+2)^2 - 2, x \geq -2$. Then $f^{-1}(x) =$

[AP EAMCET 20-08-2021_Shift-2]

1. $-\sqrt{2+x} - 2$ 2. $\sqrt{2+x} + 2$
3. $\sqrt{2+x} - 2$ 4. $-\sqrt{2+x} + 2$

56. If f is the greatest integers function defined on R as $f(x) = [x]$ and 'g' is the modulus function defined on R as $g(x) = |x|$, then the value of $(gof)\left(\frac{-5}{3}\right)$ is

[AP EAMCET 20-08-2021_Shift-2]

1. 1 2. 2
3. 3 4. 4

57. If $f : R \to R$ & $g : R \to R$ are two functions defined by $f(x) = ax + b (a \neq 0) \forall x \in R$ and $g(x) = cx^3 + d (c \neq 0) \forall x \in R$, then $(fog)^{-1}(x) =$

[AP EAMCET 20-08-2021_Shift-2]

1. $\left(\frac{x - ad + b}{ac}\right)^{\frac{1}{2}}$ 2. $\left(\frac{x + ad - b}{ac}\right)^{\frac{1}{3}}$
3. $\left(\frac{x - ad - b}{ac}\right)^{\frac{1}{3}}$ 4. $\left(\frac{x + ad + b}{ac}\right)^{\frac{1}{3}}$

58. Define $f : R \to R$ by $f(x) = \max\{x+1, 1-x, 2\}$. then f is ___

[AP EAMCET 23-08-2021_Shift-1]

1. 0 2. 1
3. x^4 4. x^2

59. The domain of the function $f(x) = \frac{1}{\sqrt{|x| - x}}$ is

[AP EAMCET 24-08-2021_Shift-2]

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

60. $[.]$ represents greatest integer function. Let $g(x) = 1 + x - [x]$ and $f(x) = \begin{cases} -3, x < 0 \\ 0, x = 0 \\ 5, x > 0 \end{cases}$ then $f(g(x))$ is

[AP EAMCET 24-08-2021_Shift-2]

1. $f(x)$ 2. -15
3. 5 4. -3

61. Let $A = \{1,2,3,4,5,6\}$ number of functions 'f' from A to A such that $f(m) + f(n) = 7$ whenever $m + n = 7$ is

[AP EAMCET 25-08-2021_Shift-1]

1. 525 2. 216
3. 200 4. 729

62. Let A be the set of all 3×3 scalar matrices with real entries. If $f : A \to R$ is defined by $f(m) = \det(m) \forall m \in A$, then '$f$' is ______

[AP EAMCET 25-08-2021_Shift-1]

1. One – one but not onto
2. Onto but not one – one
3. Bijective
4. Neither one – one nor onto

63. The inverse of the function $y = \frac{10^x - 10^{-x}}{10^x + 10^{-x}}$ is

[AP EAMCET 25-08-2021_Shift-1]

1. $\frac{1}{2}\log_{10}\left(\frac{1+x}{1-x}\right)$ 2. $\frac{1}{2}\log_{10}\left(\frac{2+x}{2-x}\right)$

3. $\frac{1}{2}\log_{10}\left(\frac{1-x}{1+x}\right)$ 4. $\frac{1}{2}\log_{10}\left(\frac{2-x}{2+x}\right)$

64. If $f : R \to R$ is defined as $f(x+y) = f(x) + f(y)\ \forall x, y \in R$ and $f(1) = 5$, then find the value of the following; $\sum_{r=1}^{n} f(r) = ?$

[AP EAMCET 25-08-2021_Shift-2]

1. $\frac{5n(n+1)}{2}$ 2. $\frac{7n(n-1)}{2}$

3. $\frac{5n(n-1)}{2}$ 4. $\frac{7n(n+1)}{2}$

65. What is the range of the function $h(x) = \frac{x-2}{x+3}$?

[AP EAMCET 25-08-2021_Shift-2]

1. $(-\infty, 2) \cup (2, \infty)$

2. $(-\infty, 1) \cup (1, \infty)$

3. $(-\infty, -3) \cup (-3, \infty)$

4. $(-\infty, -1) \cup (-1, \infty)$

66. Define $f : R \to R$ by $f(x) = \cos\left(\text{Tan}^{-1}\left(\sin\left(\text{Tan}^{-1} x\right)\right)\right)$, then $\lim_{x\to\infty}(fof)x =$

[AP EAMCET 25-08-2021_Shift-2]

1. $\frac{3}{2\sqrt{3}}$ 2. $\frac{\sqrt{2}}{3}$

3. $\sqrt{\frac{2}{3}}$ 4. $\frac{2}{3\sqrt{3}}$

67. Let $f : A \to B, g : B \to A$ defined as $f(x) = x^2, \forall x \in A$ and $g(x) = x^{1/2}, \forall x \in B$. $f(x)$ *and* $g(x)$ are inverse functions to each other when

[TS EAMCET 04-08-2021_Shift-2]

1. $A = B = R$ 2. $A = R \setminus R^-; B = R \setminus R^+$

3. $A = R; B = R \setminus R^-$ 4. $A = B = R \setminus R^-$

68. The function of $f(x) = \log\left(x + \sqrt{x^2+1}\right)$ is

[TS EAMCET 04-08-2021_Shift-2]

1. An even function
2. An odd function
3. A periodic function
4. Neither an even function nor an odd function

69. If $f : R \to R$ is defined as $f(x+y) = f(x) + f(y), \forall x, y \in R$ and $f(1) = 10$, then $\sum_{r=1}^{n}(f(r))^2 =$

[TS EAMCET 04-08-2021_Shift-1]

1. $\frac{7}{2}n(n+1)$ 2. $5n(n+1)$

3. $\frac{50}{3}n(n+1)(2n+1)$ 4. $\frac{100}{4}n^2(n+1)^2$

70. If $f : R \to R$ is defined as $f(x) = \frac{3^x + 3^{-x}}{2}, \forall x \in R$ and it satisfies $f(x+y) + f(x-y) = af(x)f(y)$, then a=

[TS EAMCET 04-08-2021_Shift-1]

1. 2 2. 1

3. 4 4. 8

71. A and B are subsets of R. Every element x of A is mapped to an element of B by the rule

$$y(x) = \begin{cases} \frac{5x}{(x-3)(x+3)} & \text{if } x \neq -1 \\ -1 & \text{if } x = -1 \end{cases},$$

Then A= **[TS EAMCET 05-08-2021_Shift-1]**

1. $R / \{-3, +3, -0\}$ 2. $R / \{-3, +3\}$

3. $R / \{-3, +3, 0, -1\}$ 4. R

72. The domain and range of $y(x)=\cos x-3$ are respectively

[TS EAMCET 05-08-2021_Shift-1]

1. $R\ and\ [-1,1]$
2. $R\ and\ [-4,-2]$
3. $R/\{0\}\ and\ [0,1]$
4. $R/\left\{(2n+1)\frac{\pi}{2}\right\}\ and\ [-1,1]$

73. Let $f(x)=\frac{1}{2}-\tan\left(\frac{\pi x}{2}\right), -1<x<1$ and $g(x)=\sqrt{3+4x-4x^2}$ then the domain $(f+g)$ is **[TS EAMCET 05-08-2021_Shift-2]**

1. $\left[\frac{1}{2},1\right)$
2. $\left[\frac{-1}{2},\frac{1}{2}\right)$
3. $\left[-\frac{1}{2},1\right)$
4. $\left[-\frac{1}{2},-1\right]$

74. Let $a>1$ be a constant. If $f:A\to A$ and $(x,y)\in f$ satisfy $a^x+a^y=a$, then $A=$

[TS EAMCET 05-08-2021_Shift-2]

1. $(0,a]$
2. $[0,a]$
3. $(-\infty,1)$
4. $(-\infty,a+1)$

75. If $f:R\setminus\{0\}\to R$ is such that $2f(x)+f\left(\frac{1}{x}\right)=4x$, and $S=\{x\in R: f(x)=-f(x)\}$, then the number of elements in S is

[TS EAMCET 06-08-2021_Shift-2]

1. 0
2. 1
3. 2
4. At least three

76. If a function $f:(-1,1)\to B(\subseteq R)$ is defined as $f(x)=x+x^2+x^3+......\infty$, then in order to have the inverse function of *f*, $B=$

[TS EAMCET 06-08-2021_Shift-2]

1. $\left(-\infty,\frac{1}{2}\right)$
2. $\left(\frac{-1}{2},\infty\right)$
3. $(-1,1)$
4. R

77. $f:[-2,2]\to[-2,2], g:[-2,2]\to[0,4]$ are two functions defined as

$$f(x)=\begin{cases}-2, & -2\le x\le 0\\ x^2-2, & 0\le x\le 2\end{cases}$$ and

$g(x)=|f(x)|+f(|x|)$, then

[TS EAMCET 06-08-2021_Shift-1]

1. f and g are injective mappings
2. f and g are surjective mappings
3. f is bijective mapping and g is injective mapping
4. f is not bijective mapping and g is surjective mapping

78. The domain of the function $f(x)=\frac{1}{\sqrt{|x|-x}}$ is

[TS EAMCET 06-08-2021_Shift-1]

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

79. The range of the real valued function $f(x)=\sqrt{\frac{x^2+2x+8}{x^2+2x+4}}$ is

[AP EAMCET 04-07-2022_Shift-1]

1. $\left[\sqrt{\frac{7}{3}},\infty\right)$
2. $(0,\infty)$
3. $(1,\infty)$
4. $\left(1,\sqrt{\frac{7}{3}}\right]$

80. If $f(x)=\sqrt{4-x^2}$ and $g(x)=\log(1-x)$ are two real valued functions then the domain of the function $(f+g)(x)$ is

[AP EAMCET 04-07-2022_Shift-1]

1. $[-2, 2]$
2. $[-2, 1)$
3. $(-\infty,1)$
4. $(1, 2]$

81. $\left\{x\in R/\frac{\sqrt{|x|^2-2|x|-8}}{\log(2-x-x^2)} \text{ is a real number}\right\}=$

[AP EAMCET 04-07-2022_Shift-2]

1. $(-\infty,-4]\cup[4,\infty)$
2. ϕ
3. (-1,2)
4. $(-\infty,-4]\cup(-1,2)\cup[4,\infty)$

82. The domain of the real valued function $f(x)=\sin\left(\log\left(\frac{\sqrt{4-x^2}}{1-x}\right)\right)$ is

[AP EAMCET 04-07-2022_Shift-2]

1. (1,4)
2. (-1,1)
3. (-2,1)
4. (-2,4)

83. $f(x)=\log\left(\left(\frac{2x^2-3}{x}\right)+\sqrt{\frac{4x^4-11x^2+9}{|x|}}\right)$ is

[AP EAMCET 05-07-2022_Shift-1]

1. An odd function
2. An even function
3. A polynomial function
4. Not a function

84. Let $f:R-\left\{\frac{-1}{2}\right\}\to R$ be defined by $f(x)=\frac{x-2}{2x+1}$. If α,β satisfy the equation $f(f(x))=-x$, *then* $4(\alpha^2+\beta^2)=$

[AP EAMCET 05-07-2022_Shift-1

1. 17
2. 12
3. 24
4. 34

85. The range of the real valued function $f(x)=\frac{x^2+x+1}{x}$ is

[AP EAMCET 05-07-2022_Shift-2]

1. $(-\infty,1)\cup(1,\infty)$
2. $(-\infty,-1]\cup[1,\infty)$
3. $(-\infty,-2]\cup[3,\infty)$
4. $(-\infty,-1]\cup[3,\infty)$

86. If a function f: R–{l} →R–{m}defined by $f(x)=\frac{x+3}{x-2}$ is a bijection. Then $3l+2m=$

[AP EAMCET 05-07-2022_Shift-2]

1. 10
2. 12
3. 8
4. 14

87. Let $f:R\to R$ defined by $f(x)=5x^4+2$. Then **[AP EAMCET 06-07-2022_Shift-1]**

1. f is one–one but not onto
2. f is onto but not one–one
3. f is both one – one and onto
4. f is neither one–one nor onto

88. Let f be a function defined by $f(xy)=\frac{f(x)}{y}$ for all positive real number x and y. If $f(30)=20$, *then* $f(40)=$

[AP EAMCET 06-07-2022_Shift-1]

1. 10
2. 15
3. 25
4. 17

89. The domain of the real valued function f(x)= $\frac{\log_2(x+3)}{\sqrt{x^2+3x+2}}$ is

[AP EAMCET 06-07-2022_Shift-2]

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

90. The domain of the real valued function f(x)= $\frac{\sqrt{2-x}+\sqrt{1+x}}{\sqrt{x+3}}$ is

[AP EAMCET 06-07-2022_Shift-2]

1. [-1,2]
2. (-1,2)
3. $[-1,\infty)$
4. $[2,\infty)$

91. If a function f satisfies $f(x+1)+f(x-1)=\sqrt{2}f(x)$, *then* $f(x+2)+f(x-2)=$

[AP EAMCET 07-07-2022_Shift-1]

1. 2.f(x)
2. f(x+1)-f(x-1)
3. 4.f(x)
4. 0

92. The domain of the real valued function $f(x)=\frac{\sqrt{\log_{0.5}(x-3)}}{\sqrt{x-1}}$

[AP EAMCET 07-07-2022_Shift-1]

1. $(3,4]$
2. $[4,\infty)$
3. $(1,\infty)$
4. $(1,3)$

93. Let $f:R\to R$ be defined by $f(x)=2x+3$, If α,β are the roots of the equation $f(x^2)-2f\left(\frac{x}{2}\right)-1=0$ then $\alpha^2+\beta^2=$

[AP EAMCET 07-07-2022_Shift-2]

1. 13
2. 25
3. 5
4. 18

94. If f is a relation from set of positive real numbers to the set of positive real numbers defined by $f(x)=3x^2-2$ then f is

[AP EAMCET 07-07-2022_Shift-2]

1. 1. one-one but not onto
2. onto but not one-one
3. a bijection
4. not a function

95. If $f:R\to R$ is defined as $f(x)=x^2-2x-3$ then f is **[AP EAMCET 08-07-2022_Shift-1]**

1. 1. One-one but not onto
2. Onto but not one-one
3. Neither one-one nor onto
4. A bijection

96. Let $f(x)=\sqrt{\frac{x+1}{x+3}}$ *and* $g(x)=\sqrt{\frac{2-x}{x+3}}$ be two real valued functions. Then the domain of f/g is **[AP EAMCET 08-07-2022_Shift-1]**

1. $(-\infty,-3)\cup[-1,\infty)$ 2. [-1,2]
3. (-3,2) 4. $(-\infty,-3)\cup[2,\infty)$

97. If the function f: **R**→ **R** is defined by $f(x)=x|x|$, then

[AP EAMCET 08-07-2022_Shift-2]

1. 1. f is one-one but not onto
2. f is onto but not one-one
3. f is both one-one and onto
4. f is neither one-one nor onto

98. The domain of the real valued function $f(x)=\sqrt{\frac{2-|x|}{3-|x|}}$ is

[AP EAMCET 08-07-2022_Shift-2]

1. $(-\infty,\infty)$ 2. $(-\infty,-3)\cup(2,\infty)$
3. $(-\infty,-3]\cup(-2,2)\cup[3,\infty)$ 4. $(-\infty,-3)\cup[-2,2]\cup(3,\infty)$

99. The domain of the real valued function $f(x)=\frac{\sqrt{6x^2+5x-6}}{\sqrt{4-x}-\sqrt{x+4}}$ is

[TS EAMCET 18-07-2022_Shift-1]

1. $\left[-4,-\frac{3}{2}\right]\cup\left[\frac{2}{3},4\right]$ 2. $\left(-\infty,\frac{-3}{2}\right]\cup\left[\frac{2}{3},\infty\right)$
3. $[-4,4]$ 4. $\left[-\frac{3}{2},\frac{2}{3}\right]$

100. If $[x]$ represents the greatest integer $\le x$, then the range of the real valued function $f(x)=\frac{1}{\sqrt{[x]^2+[x]-2}}$ is

[TS EAMCET 18-07-2022_Shift-1]

1. $(-\infty,0]\cup\left(\frac{1}{2},\infty\right)$ 2. $\left(0,\frac{1}{2}\right]$
3. $(-\infty,0)\cup[2,\infty)$ 4. $(0,2]$

101. Let R be the set of all real numbers.

Statement I : The function $f:\left(-\frac{\pi}{2},\frac{\pi}{2}\right)\to R$ defined by $f(x)=\sec x+\tan x$ is a one - one function.

Statement II : The function $f:[0,\infty)\to R$ defined by $f(x)=x^2$ is a one-one function

Which of the above statements is(are) true?

[TS EAMCET 18-07-2022_Shift-2]

1. Statement I is true, but Statement II is false
2. Statement II is true, but Statement I is false
3. Both Statement I and Statement II are true
4. Both Statement I and Statement II are false

102. Let R be the set of all real numbers. Let $f:R\to R$ be a function defined by

$$f(x)=\begin{cases}2x-5, & if\ x<-3\\ x+2, & if\ -3\le x<5\\ 3x+1, & if\ x\ge 5\end{cases}$$

Match the following

	List – I		List – II
A)	$f(-5)+f(0)+f(-1)=$	I.	16
B)	$f(f(5)+10f(-3))=$	II.	40
C)	$f(\lvert f(-4)\rvert)=$	III.	-32
D)	$f(f(f(1)))=$	IV.	-12
		V.	19

The connect match is

[TS EAMCET 18-07-2022_Shift-2]

1. 1. A – III; B – II; C – V; D – I
2. A – V; B – IV; C – I; D – III
3. A – IV; B – V; C – II; D – I
4. A – IV; B – V; C – III; D – I

103. The set of all real values of x for which $f(x)=\log_2(2^x-2)+\sqrt{1-x}$ is also real is

[TS EAMCET 19-07-2022_Shift-I]

1. R
2. $(1,\infty)$
3. $(-\infty,1]$
4. ϕ

104. Let $f(x)=1-x, g(x)=\frac{1}{1-x}, h(x)=\frac{1}{x}$ be three functions, for $x\neq 0,1$. If a function $F(x)$ satisfies $f(F(h(x)))=g(x)$, then

[TS EAMCET 19-07-2022_Shift-I]

1. $F(2022)=f(2022)$
2. $F(2022)=g(2022)$
3. $F(2022)=h(2022)$
4. $F(2022)=\frac{1}{2022}f(2022)$

105. Let $f:A\rightarrow B$ be defined as $f(x)=\frac{1}{2}-\tan\left(\frac{\pi x}{2}\right)$ and g: $B\rightarrow C$ be defined as $g(x)=\sqrt{3+4x-4x^2}$. If A,B,C are subsets of R and f is an onto function then the range of the function $f(x)$ is

[TS EAMCET 19-07-2022_Shift-2]

1. $(-\infty,\infty)$
2. $[0,\infty)$
3. $\left[-\frac{1}{2},\frac{3}{2}\right]$
4. $[-1,1]$

106. If D is the domain and G is the range of the real valued function $f(x)=\sqrt{\frac{1-x^2}{1+x^2}}$, then $D\cap G=$

[TS EAMCET 19-07-2022_Shift-2]

1. $[0,\infty)$
2. $[0,1]$
3. $\left[0,\frac{1}{2}\right]$
4. $[-1,1]$

107. The domain of the real valued function $f(x)=\sqrt{\frac{2x^2-7x+5}{3x^2-5x-2}}$ is

[TS EAMCET 20-07-2022_Shift-1]

1. $\left(-\infty,-\frac{1}{3}\right)\cup[1,2)\cup\left[\frac{5}{2},\infty\right)$
2. $(-\infty,1)\cup(2,\infty)$
3. $\left(-\frac{1}{3},\frac{5}{2}\right]$
4. $\left(-\infty,\frac{-1}{3}\right]\cup\left[\frac{5}{2},\infty\right)$

108. The range of the real valued function $f(x)=|x-2|+|x-3|$ is

[TS EAMCET 20-07-2022_Shift-1]

1. $[3,\infty)$
2. $[1,\infty)$
3. $[2,\infty)$
4. $(0,2]\cup[3,\infty)$

109. If $[x]$ represents the greatest integer function, then the set of all real values of x for which $f(x)=\sqrt{\frac{[x]-x}{x-[x]}}$ is real is

[TS EAMCET 20-07-2022_Shift-2]

1. ϕ
2. $\mathbb{R}$
3. $\mathbb{Z}$
4. $\mathbb{R}-\mathbb{Z}$

110. If $[x]$ denotes the greatest integer $\leq x$, then the range of the real valued function $f(x)=\frac{1}{\sqrt{x-[x]}}$ is

[TS EAMCET 20-07-2022_Shift-2]

1. [0, 1)
2. (0, 1)
3. (1, ∞)
4. [1, ∞)

111. If $f(x)=x^3-x$ and $g(x)=\sin 2x$, then $f\left(g\left(\frac{\pi}{12}\right)\right)=$ **[15th May 2023 Shift 1]**

1. 0
2. 1
3. $-\frac{3}{8}$
4. 2

112. For $x \in \mathbb{R}$ if $f(x)=\sqrt{\log_{10}\left(\frac{3-x}{x}\right)}$, then the domain of f is [15th May 2023 Shift 1]

1. $\left[0,\frac{3}{2}\right]$
2. $\left(0,\frac{3}{2}\right]$
3. $[0,1]$
4. $(0,1]$

113. If $f(a)=\log\left|\frac{1-a}{1+a}\right|$ *for* $a \neq \{-1,1\}$, then the set of values of all 'a', for which $f\left(\frac{2a}{1+a^2}\right)>0$ is [15th May 2023 Shift 2]

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

114. If a real valued function is defined by $f(x)=\frac{ax+\sqrt{a^2-x^2}}{bx}$, then f is [15th May 2023 Shift 2]

1. Only one- one
2. Only onto
3. Both one – one and onto
4. Neither one- one nor onto

115. Let $f: R \to R$ be a function defined by $f(x)=\frac{2x+1}{3}$, if α is an element in the domain of f whose image is $\frac{1}{\alpha}$, then the sum of all possible values of such α is [16th May 2023 Shift 1]

1. $\frac{-1}{2}$
2. $\frac{1}{2}$
3. $\frac{5}{2}$
4. 0

116. *Let* $f(x)=|x|$ *and* $g(x)=|x|+a, (a>0)$:

For $0 \le x \le b, \{(x,y)/g(x) \le y \le f(x)\}$

Represents all the points in the interior of [16th May 2023 Shift 1]

1. A parallelogram
2. A triangle
3. A Square
4. A circle

117. Let $A \subseteq R, B \subseteq R$ and $f: A \to B$ be define d by x^2-3x+2. If f is a bijection then [16th May 2023 Shift 2]

1. $A=(-\infty,0], B=\left(-\infty,\frac{-1}{4}\right]$
2. $A=\left(-\infty,\frac{3}{2}\right], B=\left[\frac{-1}{4},\infty\right)$
3. $A=\left[\frac{3}{2},\infty\right), B=\left(-\infty,\frac{-1}{4}\right]$
4. $A=(-\infty,\infty), B=\left[\frac{-1}{4},\infty\right)$

118. If $f: R \to R$ is defined by $f(x+y)=f(x)+f(y) \forall x,y \in R$ and f(1) =7 then $\sum_{r=1}^{n} f(r)=$ [16th May 2023 Shift 2]

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

119. If a set A has n elements, then the number of functions defined from A to A that are not one – one is [17th May 2023 Shift 1]

1. $(n)^{n^2}$
2. $n!-\left({}^nC_0+{}^nC_1+{}^nC_2+...+{}^nC_n\right)$
3. $n^n-n!$
4. n^n

120. If f(x) is the signum function, then in terms of f(x), the constant function $g(x)=1, \forall x \in R$ is [17th May 2023 Shift 1]

1. $g(x)=\begin{cases}2-f(x), & x<0\\ f(x), & x\ge 0\end{cases}$
2. $g(x)=\begin{cases}f(x)+f(-x), & x<0\\ f(x)f(-x), & x\ge 0\end{cases}$
3. $g(x)=\begin{cases}1+f(x), & x>0\\ 1-f(x), & x\le 0\end{cases}$
4. $g(x)=\begin{cases}f(x)+2, & x<0\\ 1+f(x), & x=0\\ f(x), & x>0\end{cases}$

121. If f(0)=0, f(1)=1, f(2)=2 and f(x)=f(x−2)+f(x−3) for x=3,4,5….., then f(10)= **[17th May 2023 Shift 2]**

1. 13
2. 9
3. 11
4. 10

122. If $f(x)=\dfrac{\cos^2 x+\sin^4 x}{\sin^2 x+\cos^4 x}\ \forall x\in R$, then f(2023)= **[17th May 2023 Shift 2]**

1. 1
2. 0
3. 2
4. π

123. If A is the domain and B is the range of the function $f(x)=\begin{cases}3x-1, & x>1\\ x^2+1, & x\le 1\end{cases}$, then A-B= **[18th May2023 shift -1]**

1. $(1,\infty)$
2. $(-\infty,1)$
3. $\mathbb{R}-(-1,1)$
4. $(-1,1)$

124. If $f:\mathbb{R}\to\mathbb{R}$ *and* $g:\mathbb{R}\to\mathbb{R}$ are defined by $f(x)=x^3-x$ and $g(x)=\sin 2x$, then the value of $x\in(0,2\pi)$ that satisfy $f(g(x))>0$, lie in the interval **[18th May2023 shift -1]**

1. $\left(\frac{\pi}{2},\pi\right)$
2. $\left(0,\frac{\pi}{2}\right)\cup\left(\frac{\pi}{2},\pi\right)$
3. $\left(\frac{\pi}{2},\frac{3\pi}{4}\right)\cup\left(\frac{3\pi}{4},\pi\right)$
4. $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$

125. The range of the real valued function $f(x)=\sqrt{9-x^2}$ is **[18th May 2023 Shift 2]**

1. [-3,3]
2. [-3,0]
3. [0,3]
4. [-2,2]

126. If $f:R\setminus\{0\}\to R$ is defined by $f(x)=x+\frac{1}{x}$, then the value of $(f(x))^2=$ **[18th May 2023 Shift 2]**

1. f(x)+f(0)
2. $f(x^2)+f(2)$
3. $f(x^3)+f(0)$
4. $f(x^2)+f(1)$

127. The range of the function $f(x)=\begin{cases}4x-1, & x>3\\ x^2-2, & -2\le x\le 3\\ 3x+4, & x<-2\end{cases}$ is **[19th May 2023 Shift 1]**

1. $(-\infty,\infty)$
2. $\mathbb{R}-(-3,3)$
3. $\mathbb{R}-(7,11]$
4. $(7,11]$

128. The domain of the function $y=f(x)$, where x and y are related by $2^x+2^y=2$ is **[19th May 2023 Shift 1]**

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

129. The range of the function $f(x)=\log_{0.5}(x^4-2x^2+3)$ is **[12TH MAY 2023 SHIFT-1]**

1. $(-\infty,\infty)$
2. $(-\infty,-1]$
3. $[-1,\infty)$
4. $[-1,1]$

130. If $f(x)=-|x|$, *then* $(fofof)(x)+(fofof)(-x)=$ **[12TH MAY 2023 SHIFT-1]**

1. $-2f(x)$
2. $|f(x)|$
3. $2f(x)$
4. $-|f(x)|$

131. If $f:[2,\infty)\to\mathbb{R}$ is defined by $f(x)=x^2-4x+5$, then the range of f is **[12TH MAY 2023 SHIFT-1]**

1. $\mathbb{R}$
2. $[1,\infty)$
3. $[4,\infty)$
4. $[5,\infty)$

132. The domain of the function $f(x)=Sin^{-1}\left(\log_2\left(\frac{x^2}{2}\right)\right)$ is **[12TH MAY 2023 SHIFT -2]**

1. $[-2,0)\cup(0,1)$
2. $[1,\infty)\cap[-2,2]$
3. $[-2,-1]\cup[1,2]$
4. $(-\infty,1]\cap[-2,2]$

133. The range of the function

$f(x)=-\sqrt{-x^2-6x-5}$ is

[12[TH] MAY 2023 SHIFT -2]

1. $[0,2]$ 2. $[-2,0]$

3. $[-2,2]$ 4. $(-\infty,2]$

134. If $f:\mathbb{R}\to\mathbb{R}$ is defined by $f(x)=2x+\sin x$, $x\in R$, then f is

[12[TH] MAY 2023 SHIFT -2]

1. One-one and onto
2. One-one but not onto
3. Onto but not one-one
4. Neither one-one nor onto

135. If the function $f:R\to R$ is defined by

$$f(x)=\begin{cases}2x-3, if\ x<-2\\ x^2-1,\ if -2\le x\le 2\\ 3x+2, if\ x>2\end{cases}$$ then f is

[13[TH] MAY 2023 SHIFT-1]

1. An injection but not a surjection
2. A surjection but not an injection
3. A bijection
4. Neither injection nor surjection

136. The domain of the real valued function

$f(x)=\frac{\sqrt{\log_{10}\left(\frac{x}{x-2}\right)}}{\sqrt{[x]^2-5[x]+6}}$ is (Here [x] denotes the greatest integer function)

[13[TH] MAY 2023 SHIFT-1]

1. $(-\infty,0)\cup(2,\infty)$ 2. $(2,\infty)$

3. $(-\infty,2)\cup(4,\infty)$ 4. $[4,\infty)$

137. The range of the real valued function

$f(x)=\frac{1}{x-|x|}$ is

[13[TH] MAY 2023 SHIFT-1]

1. $(0,\infty)$ 2. $(-\infty,0)$

3. $(-\infty,0)\cup(0,\infty)$ 4. $(-\infty,\infty)$

138. Which one of the following functions is a bijection? **[EAPCET 13-05-23 SHIFT-2]**

1. $f:\mathbb{R}-\mathbb{Z}\to[0,1]$ defined by $f(x)=\sqrt{x-[x]}$. (Here $[x]$ represents the greatest integer function).

2. $f:\mathbb{R}\to(-\infty,2)$ defined by $f(x)=4x-x^2-3$.

3. $f:(5,\infty)\to\mathbb{R}-\{0\}$ defined by $f(x)=\frac{1}{\sqrt{x-5}}$

4. $f:[0,4]\to[0,4]$ defined by $f(x)=\sqrt{16-x^2}$

139. The domain of the real valued function

$f(x)=\frac{\sqrt{|x|-x}}{\sqrt{x-[x]}}$ is

[EAPCET 13-05-23 SHIFT-2]

1. $\mathbb{Z}$ 2. ϕ

3. $\mathbb{R}-\mathbb{Z}$ 4. $\mathbb{R}$

140. The range of the function defined by

$$f(x)=\begin{cases}2x-3, & if\ x<-1\\ 1-x^2, & if\ -1\le x\le 1\\ 3x^2+2, & if\ x>1\end{cases}$$ is

[EAPCET 13-05-23 SHIFT-2]

1. $\mathbb{R}$
2. $(-\infty,-5)\cup[0,1]\cup(5,\infty)$
3. $(-\infty,-1)\cup(1,\infty)$
4. $(-\infty,-3)\cup(0,1)\cup(3,\infty)$

KEY

1)	2	2)	4	3)	2	4)	3	5)	3
6)	4	7)	2	8)	2	9)	3	10)	1
11)	2	12)	4	13)	3	14)	4	15)	1
16)	4	17)	4	18)	2	19)	1	20)	3
21)	4	22)	3	23)	3	24)	3	25)	2
26)	4	27)	3	28)	1	29)	4	30)	3

31) 3	32) 3	33) 2	34) 3	35) 4
36) 3	37) 2	38) 1	39) 2	40) 3
41) 1	42) 3	43) 2	44) 4	45) 4
46) 2	47) 3	48) 1	49) 2	50) 4
51) 3	52) 1	53) 2	54) 4	55) 3
56) 2	57) 3	58) 2	59) 2	60) 3
61) 2	62) 3	63) 1	64) 1	65) 2
66) 1	67) 4	68) 2	69) 3	70) 1
71) 2	72) 2	73) 3	74) 3	75) 3
76) 2	77) 2	78) 2	79) 4	80) 2
81) 2	82) 3	83) 1	84) 1	85) 4
86) 3	87) 4	88) 2	89) 4	90) 1
91) 4	92) 1	93) 3	94) 4	95) 3
96) 2	97) 3	98) 4	99) 1	100) 2
101) 3	102) 3	103) 4	104) 2	105) 3
106) 2	107) 1	108) 2	109) 1	110) 3
111)3	112)2	113)2	114)2	115)2
116)1	117)2	118)3	119)3	120)4
121)1	122)1	123)2	124)1	125)3
126)4	127)4	128)2	129)2	130)3
131)2	132)3	133)2	134)1	135)4
136)4	137)2	138)4	139)3	140)2

SOLUTIONS

1. $\left([x]^2-[x]-2\right)>0$

$([x]+1)([x]-2)>0$

$\Rightarrow [x]<-1,\ [x]>2$

$\Rightarrow x\in(-\infty,-1)\cup[3,\infty)$

$\Rightarrow R-[-1,3)$

2. Here $f(x)=kx,\ k\in R$

$\Rightarrow$ infinitely many bijections exist

3. $-1\le\frac{x-3}{2}\le 1$ *and* $4-x>0$

$1\le x\le 5$ $\qquad x<4$

$\Rightarrow x\in[1,4)$

4. Given $f:R\to R$

let

$y=\frac{x}{\sqrt{1+x^2}}$

$y^2=\frac{x^2}{1+x^2}$

$y^2\left(1+x^2\right)=x^2$

$x^2=\frac{y^2}{1-y^2}\Rightarrow x=\frac{y}{\sqrt{1-y^2}}$ is defined

$1-y^2>0; y^2\ne 1$

$y^2<1\ ; y\ne -1,1$

$y\in(-1,1)$

$y\in(-1,1)-\{0\}$

range $\ne$ *co* $-$ *domain*

$\therefore$ *f is not surjective*

$f(x)=\frac{x}{\sqrt{1+x^2}}$

Different values of x has different images

$\therefore f$ is 1,-1

Injective but not surjective

5. Given

$f(x)=\frac{\sin\pi[x]}{1+[x]}+\frac{x}{2+3x}$

let $g(x)=\frac{\sin\pi[x]}{1+[x]}, h(x)=\frac{x}{2+3x}$

domains :

$1+[x]\ne 0\ \ ,2+3x\ne 0$

$[x]\ne -1,\qquad x\ne\frac{-2}{3}$

$x\notin[-1,0)$

$\therefore$ *domain of* $f(x)=R-[-1,0)$

Range of f(x):

$\frac{x}{2+3x}=y$

$\Rightarrow x=\frac{2y}{1-3y}=h^{-1}(y)$

$\therefore h^{-1}(x)=\frac{2x}{1-3x}$

$\Rightarrow 1-3x\neq 0\Rightarrow x\neq\frac{1}{3}$

$D(h^{-1}(x))=R-\left\{\frac{1}{3}\right\}$

$range\ of\ h(x)=D(h^{-1}(x))=R-\left\{\frac{1}{3}\right\}$

$\therefore Range\ of\ f(x)=R-\left\{\frac{1}{3}\right\}$

6. Let

$f(x)=a^n$

$f(x+y)=f(x)+f(y)$ *is true* $\forall x,y\in Z$

$\therefore$ *Infinite functions exists.*

7. $f(x+y)=f(x)+f(y), x,y\in R$

Let $x=1$ *and* $b=1$

$f(2)=2f(1)$

$f(3)=3f(1)$

$\sum_{t=1}^{39} f(t)=f(1)+f(2)+........+f(39)$

$=f(1)+2f(1)+.........+39f(1)$

$=f(1)(1+2+3+....+39)$

$=\frac{7\times 39\times 40}{2}=5460$

8. $(gof)(t-2)=t$

Let $t-2=z$

$(gof)(z)=z+2$

$g(f(z))=z+2$

$g(3z-2)=z+2$

let $3z-2=x$

$g(x)=\frac{x+8}{3}$

9. $f(x)=\frac{x^6}{x^6+2020}$

$=1-\frac{2020}{x^6+2020}$

<1

as x=0, we have

$f(x)=0$

$\therefore$ Range is $[0,1)$

10. f(x)=0 is only function

11. $f(x)=\frac{2020^x}{2020^x+\sqrt{2020}}$

$f(1-x)=\frac{2020^{1-x}}{2020^{1-x}+\sqrt{2020}}$

$f(1-x)=\frac{\sqrt{2020}}{2020^x+\sqrt{2020}}$

$\therefore f(x)+f(1-x)=1$

Now,

$=2\left[f\left(\frac{1}{4040}\right)+f\left(\frac{2}{4040}\right)+......+f\left(\frac{4038}{4040}\right)+f\left(\frac{4039}{4040}\right)\right]$

$=2.\frac{4039}{2}=4039$

12. $(fog)(x)=e^{\log x}=x$

Which is an identity function

Every identity function must be a both one-one and onto

13. Given $|x|-x\geq 0$

$\Rightarrow |x|\geq x, \forall x\in R$

Domain is $(-\infty,\infty)$

14. Data insufficient (concept)

15. Take $f(x)=x+\frac{1}{x}$

Now $(f(x))^2=\left(x+\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}+2.....(1)$

And $f(x^2)+f(1)=x^2+\frac{1}{x^2}+2........(2)$

From (1) &(2), we get

$(f(x))^2=f(x^2)+f(1)$

16. Conc8eptual

17. Conceptual

18. Conceptual

19. Conceptual

20. $f(x)=\sin x-\cos x$

$f(-x)=-\sin x-\cos x$

$f(x)\neq f(-x)$

$f(x)\neq -f(x)$

$\therefore f(x)$ is neigher even nor odd.

21. Conceptual

22. Conceptual

23. $x-[x]$ period is 1

24. $(fof)(x)=f(f(x))$

$=f\left[2020-x^{2019}\right]^{\frac{1}{2019}}$

$=\left[2020-\left(2020-x^{2019}\right)^{2019}\right]^{\frac{1}{2019}}=x$

$(fofofof)(x)=(fof)(x)=x$

25. Conceptual

26.

$$f(x)=\frac{e^{|x|}-e^{-x}}{e^{x}+e^{-x}}+\cos^3\left(\frac{x}{2}\right)$$

$$f(x)=\begin{cases}\frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}+\cos^3\left(\frac{x}{2}\right) & ,x>0\\ \cos^3\frac{x}{2} & ,x\leq 0\end{cases}$$

$\therefore f(x)\neq 0,\ \forall x\in R$

$\therefore f(x)$ is not bijective.

27. $A=\{1,2,3,.....,n\}$ and $B=\{a,b\}$

No. of onto functions =62

$2^n-2=62\Rightarrow n=6$

No. of subsets of A containing exactly three elements is ${}^{n}C_3={}^{6}C_3=20$

28. A) $\left[1+\cos^2 x\right]=1\, or\, 2$

Range of $\sec^{-1}\left[1+\cos^2 x\right]$ is

$\{\sec^{-1}1,\sec^{-1}2\}$

B) $f\left(x+\frac{1}{x}\right)=x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2$

$f(y)=y^2-2$

$y=x+\frac{1}{x}\geq 2\, or \leq -2$

Domain is IR-(-2,2)

C) $f(x)=kx$

$f(1)=5\Rightarrow k=5$

$f(x)=5x$ is an odd function

D) $\sin^{-1}x-\cos^{-1}x+\sin^{-1}(1-x)=0$

It satisfies for $x=0,\frac{1}{2}$

29. $f(x)=\sec^{-1}(3x-4)+\tanh^{-1}\left(\frac{x+3}{5}\right)$

$3x-4\leq -1\, or\, 3x-4\geq 1\, and\, -1\leq\frac{x+3}{5}\leq 1$

$\Rightarrow x\in(-8,1]\cup[5/3,2)$

30. Different elements have different images

$f(x)=1$

$\frac{x}{\sqrt{1+x^2}}=1\Rightarrow x^2=1+x^2\ \exists no\ x\in R$

Not surjective

31. $0\leq \text{Tan}^{-1}\left(x^2+x+\alpha^2\right)<\frac{\pi}{2}$

$0\leq\left(x^2+x+\alpha^2\right)<\infty$

$x^2+x+\alpha^2\geq 0$

$\Delta\leq 0$

$1-4\alpha^2\leq 0$

$4\alpha^2-1\geq 0$

$\left(-\alpha,\frac{-1}{2}\right]\cup\left[\frac{1}{2},\alpha\right)$

32. Clearly $f(6)=10$ and $f(7)=10$

Different elements have same f-image

$\therefore$ f(x) is not 1-1

$\therefore$ Range=co-domain

$\therefore$ f is onto

33. $\log_{10}\left(\frac{5x-x^2}{4}\right)\geq 0$ and $\frac{5x-x^2}{4}>0$

$\frac{5x-x^2}{4}\geq 1$ and $x^2-5x<0$

$x\in[1,4]$ and $x\in(0,5)$

Domain of $f(x)=[1,4]$

34. $f(x)=x-\frac{1}{x}$

$3f(x)=3x-3$

By option verification

$f(x^3)-(f(x))^3=x^3-\frac{1}{x^3}-\left(x-\frac{1}{x}\right)^3$

$f(x^3)-(f(x))^3 = 3f(x)$

35. $f(x)=g(x)$

$[x]=3\left[\frac{x}{3}\right]$

$\frac{[x]}{3}=\left[\frac{x}{3}\right]$

$x \in [3n, 3n+1), n \in z$

36. Given function $f:[-3,2] \to \left[0, \sqrt[3]{x}\right]$,

When $-3 \le n \le -1$, $f(n)=2+\sqrt[3]{n}$

And $-1 \le n \le 2$, $f(n)=n^{\frac{2}{3}}$

Now, $\left.\begin{array}{l} f(-3)=2-\sqrt[3]{3} \\ f(-2)=2-\sqrt[3]{2} \\ f(-1)=1 \end{array}\right\} \forall n \in [-3,-1]$

And $\left.\begin{array}{l} f(0)=0 \\ f(1)=1 \\ f(2)=\sqrt[3]{4} \end{array}\right\} \forall n \in [-1,2]$

w.kt $f(2)=\sqrt[3]{x}$

by comparing x=4 [∵ The function is on to, range=codomain]

37. $f(x)=\frac{x-[x]}{\sqrt{|x|-x}}$ $g(x)=\frac{x-[x]}{\sqrt{|x|+x}}$

To define $f(x)$ | To define $g(x)$

$|x|-x>0$ | $|x|+x>0$

$|x|>x$ | $|x|>-x$

$\forall x \in (-\infty,0)$ | $\forall x \in (0,\infty)$

i.e. $A \in (-\infty,0)$ *i.e.* $B \in (0,\infty)$

Clearly $A \cap B = \phi$

38. $f(x+y)=f(x)+f(y),\ \forall x,y \in Z$

$f(x)=Kx$

39. $A_1=\left\{\frac{2K}{K \in N}\right\}, A_2=\left\{\frac{3K}{K \in N}\right\} \ldots A_n=\left\{\frac{nK}{K \in N}\right\}$

$X=A_1 \cup A_2 \cup \ldots\ldots A_n$

$f: X \to N,\ f(x)=x$

Has no pre image so it is not onto but it is one-one

40. $f(n_1)=f(n_2)$

$\left(r_1+1, \frac{q_1+1}{2}\right)=\left(r_2+1, \frac{q_2+1}{2}\right)$

$\Rightarrow r_1=r_2$ and $q_1=q_2$

∴ f is one-one

Let $\left(r+1, \frac{q+1}{2}\right) \in N \times N$

Let $r+1=t \in N$

$r=t-1 \in N$

$\frac{q+1}{2}=m \in N$

$q=2m-1 \in N$

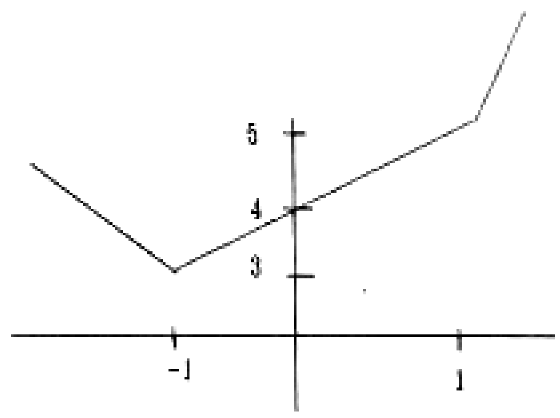
$\therefore q.2^r \in N$

$\exists\ q.2^r \in N$ such that $f(n)=\left(r+1, \frac{q+1}{2}\right)$

∴ f is onto

∴ f is bijection.

41. $f(x)=\begin{cases} -3x & ,x<-1 \\ x+4 & ,-1<x<1 \\ 5x & ,x>1 \end{cases}$



By graph, element in codomain 3 has unique pre-image in domain.

42. $f(n)=\cos nx(\sec x)^n$

$f(2020)-f(2019)+\tan x.g(2019)=\cos(2020x)(\sec x)^{2020}$

$-\cos(2019)(\sec x)^{2019}+\tan x \sin(2019x)(\sec x)^{2019}$

$=(\sec x)^{2019}\left[\cos 2020x.\sec x-\cos 2019x+\frac{\sin x}{\cos x}.\sin 2019x\right]$

$=(\sec x)^{2020}[\cos 2020x-\cos 2020x]=0$

43. f is not one-one because $f(0)=f(-1)=1$

And $f(Z)=N \Rightarrow f$ *is onto*

44. $-1 \le \log_5\left[x^2+7x+15\right] \le 1$

$\Rightarrow \frac{1}{5} \le \left[x^2+7x+15\right] \le 5$

$\Rightarrow \frac{1}{5} \le x^2+7x+15$ *and* $x^2+7x+15 \le 5$

$\Rightarrow 5x^2+35x+74 \ge 0\ \forall \in R$

and $x^2+7x+10 \le 0$

$\Rightarrow x \in R$ *and* $-5 \le x \le -2$

domain $=[-5,-2] \cap R = [-5,-2]$

45. $f(n)=A(-2)^n+B(-3)^n\ \forall A,B \in R$ *and* $n \in N-\{1,2\}$

put $n=0,1,0,3$

we get $f(0)=A+B, f(1)=-2A-3B,$

$f(2)=4A+9B, f(3)=-8A-27B$

Now

$f(n)+af(n-1)+bf(n-2)=0$

put $n=2,3$

$f(2)+af(1)+bf(0)=0$ *and*

$f(3)+af(2)+bf(1)=0$

And substitute above in it, we get $a=5, b=6$

46. $(gof)(x)=g\left[f(x)\right]$

$=g[2x+1]$

$=(2x+1)^2-2$

$=4x^2+4x-1$

47. $f(x+y)=\frac{a^x a^y+a^{-x}a^{-y}}{2}$

$f(x-y)=\frac{a^x a^{-y}+a^{-x}a^y}{2}$

$f(x+y)+f(x-y)=\frac{a^x\left(a^y+a^{-y}\right)+a^{-x}\left(a^{-y}+a^y\right)}{2}$

$=\frac{\left(a^x+a^{-x}\right)\left(a^y+a^{-y}\right)}{2}$

$=2\times\left(\frac{a^x+a^{-x}}{2}\right)\left(\frac{a^y+a^{-y}}{2}\right)$

$=2f(x)f(y)$

48. $x \in (0,1) \Rightarrow [x]=0$

$f(x)=\min\{x,-x\}$

$(fofofof)(x)=f\left[f\left[f(-x)\right]\right]$

$=f\left[f(x)\right]$

$=f(-x)=x$

49. $f(-x)=\frac{-x}{e^{-x}-1}-\frac{x}{2}+1$

$=\frac{-xe^x}{1-e^x}-\frac{x}{2}+1$

$=\frac{xe^x}{e^x-1}-\frac{x}{2}+1$

$=\frac{x\left[\left(e^x-1\right)+1\right]}{e^x-1}-\frac{x}{2}+1$

$=x+\frac{x}{e^x-1}-\frac{x}{2}+1$

$=\frac{x}{e^x-1}+\frac{x}{2}+1=f(x)$

$\therefore f(x)$ is an even function

50. $[x]-1 \ne 0$

$[x] \ne 0$

$x \ne [1,2)$

Domain $R-[1,2)$

51. $f(x)=\frac{4^x}{4^x+2}$

$f(1-x)=\frac{4^{1-x}}{4^{1-x}+2}=\frac{2}{4^x+2}$

$f(x)+f(1-x)=\frac{4^x+2}{4^x+2}=1$

$=f\left(\frac{1}{4}\right)+f\left(1-\frac{1}{4}\right)+f\left(\frac{1}{2}\right)+f\left(1-\frac{1}{2}\right)$

$=1+1=2$

52. $g(f(x))=\sin 2x$ is invertible $-\frac{\pi}{2} \le 2x \le \frac{\pi}{2}$

$-\frac{\pi}{2} \le x \le \frac{\pi}{4}$

53. $f(x)=x^9-11x^8-2x^7+22x^6$

$+x^4-12x^3+11x^2+11x-3$

$=11^9-11\times11^8-2\times11^7+22\times11^6$

$+11^4-12\times11^3+11^3+11-3$

$=8$

54. $(fog)(x)=(gof)(x)$

$f[g(x)]=g(f(x))$

$(3^x)^3=3^{x^3}$

$x(x^2-3)=0$

Given $x\neq0$ so $x^2-3=0$

55. $f(x)=(x+2)^2-2=y$

$x=\sqrt{y+2}-2$ $(\therefore x\geq-2)$

$f^{-1}(y)=\sqrt{y+2}-2$

$f^{-1}(x)=\sqrt{x+2}-2$

56. $(gof)\left(\frac{-5}{3}\right)=g\left(f\left(\frac{-5}{3}\right)\right)$

$=g(-2)=2$

57. $(fog)(x)=f[g(x)]$

$=f[cx^3+d]$

$=acx^3+ad+b=y$

$x=\left(\frac{y-ad-b}{ac}\right)^{\frac{1}{3}}$

$f^{-1}(x)=\left(\frac{x-ad-b}{ac}\right)^{\frac{1}{3}}$

58. Insufficient data

59. $|x|-x>0$

$|x|>x$

$x\in(-\infty,0)$

60. $g(x)=1+\{x\}$

$$f(g(x))=\begin{cases}-3 & if \quad 1+\{x\}<0\rightarrow(1)\\0 & if \quad 1+\{x\}=0\rightarrow(2)\\5 & if \quad 1+\{x\}>0\end{cases}$$

(1) and(2) always not possible

$f(g(x))=5$

61. $A=\{1,2,3,4,5,6\}$

No of ways selecting $m+n=7$ is $6C_1=6$

These are $(1,6)(6,1)(2,5)(5,2)(3,4)(4,3)$

$(1,6)(6,1)$ maps to f images so that

$f(1)+f(6)=7$ (or)

$f(6)+f(1)=7$ in 6 $ways$

Similarly $(2,5)(5,2)$ maps to 6 ways

$(3,4)(4,3)$ maps to 6ways

62. $let\ A=\left\{\begin{bmatrix}k&0&0\\0&k&0\\0&0&k\end{bmatrix}/k\in R\right\}$

No two scalar matrices have same determinant

f is one-one

f is onto

f is bijective

63. $y=\frac{(10^x)^2-1}{(10^x)^2+1}$

$10^{2x}=\frac{1+y}{1-y}$

$x=\frac{1}{2}\log_{10}\left(\frac{1+y}{1-y}\right)$

$f^{-1}(x)=\frac{1}{2}\log_{10}\left(\frac{1+x}{1-x}\right)$

64. $f(1)=5$

$f(2)=2\times 5$

$f(3)=3\times 5$

.

.

$f(n)=n\times 5$

$\sum_{r=1}^{n} f(n)=5[1+2+..+n]$

$=\frac{5n(n+1)}{2}$

65. $y=\frac{x-2}{x+3}$

$\Rightarrow x=\frac{3y+2}{1-y}$

$1-y\neq 0$

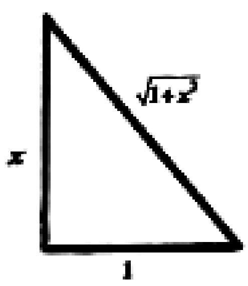
$y\neq 1$

$\therefore Range=(-\infty,1)\cup(1,\infty)$

66. $\tan^{-1}x=\alpha$

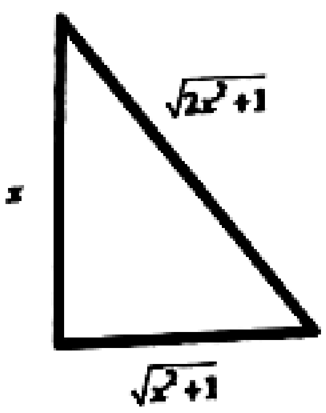
$\tan\alpha=\frac{x}{1}$

$\sin\alpha=\frac{x}{\sqrt{1+x^2}}$



$f(x)=\cos\left[\tan^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)\right]$

$\tan\beta=\frac{x}{\sqrt{x^2+1}}$



$f(x)=\sqrt{\frac{x^2+1}{2x^2+1}}$

$(fof)(x)=f(f(x))$

$=\sqrt{\frac{3x^2+2}{4x^2+3}}$

$\lim_{x\to\infty}(f0f)(x)=\sqrt{\frac{3}{4}}$

$=\frac{3}{2\sqrt{3}}$

67. Conceptual

68. $f(x)=\log\left(x+\sqrt{x^2+1}\right)$

$f(-x)=\log\left(-x+\sqrt{x^2+1}\right)$

$=\log\left(\frac{x^2+1-x^2}{\sqrt{x^2+1}+x}\right)$

$=-\log\left(x+\sqrt{x^2+1}\right)$

$=-f(x)$

$f(x)$ is an odd function.

69. $f(x)=kx$

$f(1)=k\Rightarrow k=10$

$\sum_{r=1}^{n}(f(r))^2=\sum_{r=1}^{n}(10r)^2$

$=100\frac{n(n+1)(2n+1)}{6}$

$=\frac{50n(n+1)(2n+1)}{3}$

70. $f(x)=\frac{3^x+3^{-x}}{2}$

$f(x+y)+f(x-y)$

$=\frac{3^{x+y}+3^{-(x+y)}}{2}+\frac{3^{x-y}+3^{-(x-y)}}{2}$

$=\frac{3^x\left(3^y+3^{-y}\right)+3^{-x}\left(3^y+3^{-y}\right)}{2}$

$=\frac{\left(3^x+3^{-x}\right)\left(3^y+3^{-y}\right)}{2}\times\frac{2}{2}$

$=2f(x)f(y)$

71. Given

$$y(x)=\begin{cases}\dfrac{5x}{(x-3)(x+3)} & if\ x\neq -1\\ -1 & if\ x=-1\end{cases}$$

$Case(i)$:

$y=\dfrac{5x}{x^2-9}, x\neq -1$

$x^2-9\neq 0$

$x\neq\{-3,3\}$

$case(ii)$:

$y=-1,\ x=-1$

Clearly $x\in R-\{-3,3\}$

i.e., $\forall x\in R-\{-3,3\}\exists y\in R\ni f(x)=y$

72. Let $f(x)=\cos x-3$

W.k.t Domain of $\cos x$ is 'R',

$\therefore$ Domain of $f(x)$ is R.

and Range of $f(x)$ is,

$-1\le\cos x\le 1$

$-4\le\cos x-3\le -2$

$-4\le f(x)\le -2$

$\therefore f(x)\in[-4,-2]$

73. Domain of $f(x)$ is $\dfrac{\pi x}{2}\neq(2n+1)\dfrac{\pi}{2}$

$x\neq(2n+1), n\in 2$

Domain of $g(x)$ is $3+4x-4x^2\ge 0$

$4x^2-4x-3\le 0$

$\Rightarrow(2x-3)(2x+1)\le 0$

$\Rightarrow x\in\left[\dfrac{-1}{2},\dfrac{3}{2}\right]$

Domain of $f+g$ is $\left[\dfrac{-1}{2},1\right)$

74. Given $a^x+a^y=a$

$\Rightarrow a^x=a-a^y$

$a^x<a \qquad (\because a^y>0)$

$x<\log_a a$

$x<1$

$x\in(-\infty,1)$

75. $2f(x)+f\left(\dfrac{1}{x}\right)=4x......(1)$

Replace 'x' by '$\dfrac{1}{x}$'

$2f\left(\dfrac{1}{x}\right)+f(x)=\dfrac{4}{x}.....(2)$

$(2)\times(1)-(2)\Rightarrow 3f(x)=8x-\dfrac{4}{x}$

$f(x)=\dfrac{8x^2-4}{3x}$

Now take $f(x)=f(-x)\Rightarrow x=\pm\dfrac{1}{\sqrt{2}}$

No. of elements is $S=2$.

76. $f(x)=\dfrac{x}{1-x}$

Let $f(x)=y\Rightarrow\dfrac{x}{1-x}=y\Rightarrow x=\dfrac{y}{1+y}$

We have $-1<x<1$

$-1<\dfrac{y}{1+y}<1$

$\dfrac{y}{1+y}>-1$ and $\dfrac{y}{1+y}<1$

$\dfrac{y}{1+y}>0$ and $\dfrac{y}{1+y}-1<0$

$\dfrac{y}{y+1}+1>0$ and $\dfrac{-1}{1+y}<0$

$\dfrac{2y+1}{y+1}>0$ and

$y\in(-\infty,-1)\cup\left(\dfrac{-1}{2},\infty\right)$ and $y>-1$

$y\in(-1,\infty)$

$\therefore B=\left(\dfrac{-1}{2},\infty\right)$

77. conceptual

78. $f(x)=\dfrac{1}{\sqrt{|x|-x}}$

$|x|-x>0\Rightarrow|x|>x$

By verifying $x\in(-\infty,0)$

79. $f(x)=\sqrt{\dfrac{x^2+2x+8}{x^2+2x+4}}=\sqrt{1+\dfrac{4}{(x+1)^2+3}}$

$At\ x=1$ is has maximum value is

$At\ x=\infty$ is has minimum value

$Range=[1,\sqrt{7/3}]$

---

80. $f(x)=\sqrt{4-x^2}$ $\quad g(x)=\log(1-x)$

$4-x^2\geq 0$ $\quad 1-x>0$

$x^2-4\leq 0$ $\quad 1>x$

$x\in[-2,2]$ $\quad x<1$

---

81. $|x^2|-2|x|-8\geq 0\ and\ 2-x^2-x>0$

$x>0\ ,x^2-2x-8\geq 0$

$(x-4)(x+2)\geq 0$

$x\in(-\infty,-2]\cup[4,\infty)$

$x<0,x^2+2x-8\geq 0$

$(x+4)(x-2)\geq 0$

$x\in(-\infty,-4]\cup[2,\infty)$

$2-x-x^2>0$

$x^2+x-2<0$

$(x+2)(x-1)<0$

$x\in(-2,1)$

$domain\ is\ \phi$

---

82. $\dfrac{\sqrt{4-x^2}}{1-x}>0$

$4-x^2>0$ $\quad and \quad$ $1-x>0$

$x^2-4<0$ $\quad 1-x$

$(x+2)(x-2)<0$ $\quad x<1$

$x\in(-2,2)$ $\quad x\in(-2,1)$

$domain=(-2,1)$

---

83. Data in correct

---

84. $f(x)=\dfrac{x-2}{2x+1}$

$f[f(x)]=-x$

$f\left[\dfrac{x-2}{2x+1}\right]=-x$

$2x^2-3x-2=0$

$2x^2-4x+x-2=0$

$2x(x-2)+1(x-2)=0$

$(x-2)(2x+1)=0$

$(x-2)\ or\ x=-1/2$

$4(\alpha^2+\beta^2)=4\left(4+\dfrac{1}{4}\right)=4\times\dfrac{17}{4}=17$

---

85. $f(x)=\dfrac{x^2+1+x}{x}=x+\dfrac{1}{x}+1$

$x+\dfrac{1}{x}\geq 2\ or\ x+\dfrac{1}{x}\leq -2$

$Range=(-\infty,-1]\cup[3,\infty)$

---

86. $f(x)=\dfrac{x+3}{x-2}$ $\quad y=\dfrac{x+3}{x-2}$

$x-2\neq 0$ $\quad x=\dfrac{3+2y}{y-1}$

$x\neq 2$ $\quad y\neq 1$

$R-\{2\}$ $\quad R-\{1\}$

$l=2 \quad m=1 \quad 3l+2m=8$

---

87. $a\in R$ a,–a have same image

$\therefore$ f is not one–one

–ve real numbers have no pre image

$\therefore$ f is not an onto

---

88. $f(xy)=\dfrac{f(x)}{y}$

$f(30)=f(10\times 3)=\dfrac{f(10)}{3}$

$20=\dfrac{f(10)}{3}$

$f(10)=60$

$f(40)=f(10\times 4)$

$=\dfrac{f(10)}{4}$

$=\dfrac{60}{4}$

$=15$

---

89. $x+3>0\ and\ x^2+3x+2>0$

$x>-3\ and\ (x+2)(x+1)>0$

$x\in(-3,\infty)\ and\ x\in(-\infty,-2)\cup(-1,\infty)$

$Domain=(-3,-2)\cup(-1,\infty)$

---

90. $2-x\geq 0\ and\ 1+x\geq 0\ and\ x+3>0$

$x\leq 2\ and\ x\geq,-1\ and\ x>-3$

$Domain=[-1,2]$

---

91. Data in correct

---

92. $\log_{0.5}(x-3)\geq 0\ and\ x-3>0\ and\ x-1>0$

$0<x-3\leq 1$ $\quad x>3$ $\quad x>1$

$x\leq 4$

$domain=(3,4]$

93. $f(x^2)-2f(x/2)-1=0$

$2x^2-2x-4=0$

$x^2-x-2=0$

$(x-2)(x+1)=0$

$x=2 \, or -1$

$\alpha=2 \quad \beta=-2$

$\alpha^2+\beta^2=4+1=5$

94. Conceptual

95. $f(x)=x^2-2x-3$

$f^1(x)=2x-2$

$f^1(x)>0 \; for \; x>1$

$f^1(x)<0 \; for \; x<1$

$\therefore f(x)= is \; not \; one-one$

$f(x)=(x-1)^2-4$

$Minimum \; value \; of \; f(x) \; is -4$

$\therefore f \; is \; not \; onto$

96. $(x+1)(x+3)\geq 0 \; and \; (x-2)(x+3)\leq 0$

$and \; x+3\neq 0$

$x\in(-\infty,-3]\cup[-1,\alpha) \; and \; x\in[-3,-2]$

$and \; x\neq -3$

$Domain=[-1,2]$

97. $f(x)=x|x|=\begin{cases} x^2 & x\geq 0 \\ -x^2 & x<0 \end{cases}$

$\therefore f \; is \; one-one \; and \; anto$

98. $(2-|x|)(3-|x|)\geq 0 \; and \; 3-|x|\neq 0$

$(|x|-2)(|x|-3)\geq 0 \; and \; |x|\neq 3$

$x\neq \pm 3$

$\therefore x\in(-\infty,-3)\cup[-2,2]\cup(3,\infty)$

99. $6x^2+5x-6\geq 0$

$(2x+3)(3x-2)\geq 0$

$x\in\left(-\infty,\frac{-3}{2}\right)\cup\left[\frac{2}{3},\infty\right)$

$4-x\geq 0 \; and \; 4+x\geq 0 \quad and \; \sqrt{4-x}\neq\sqrt{x+4}$

$x\leq 4 \; and \qquad x\geq -4 \quad and \quad 4-x\neq x+4$

$x\neq 0$

$Domain=[-4,-3/2]\cup\left[\frac{2}{3},4\right]$

100. $[x]^2+[x]-2>0$

$([x]+2)([x]-1)>0$

$[x]\in(-\infty,-3]\cup[2,\infty]$

$\text{Range}=\left(0,\frac{1}{2}\right]$

101. $f(x)=\frac{1+\sin x}{\cos x}$

$f'(x)=\frac{1+\sin x}{\cos^2 x}>0$

$f(x)$ is one-one

Clearly $f(x)$ is onto

102. By verification

103. $2^x-2>0 \; and \; 1-x\geq 0$

$2^x>2 \quad and \quad 1\geq x$

$x>1$

$domain=\phi$

104. $f\left(F\left(\frac{1}{x}\right)\right)=\frac{1}{1-x}$

$1-F\left(\frac{1}{x}\right)=\frac{1}{1-x}$

$F\left(\frac{1}{x}\right)=\frac{x}{x-1}$

$F(2022)=\frac{-1}{2022}$

Verify options

105. $3+4x-4x^2\geq 0$

$4x^2-4x+3\leq 0$

$(2x+1)(2x-3)\leq 0$

$x\in\left[\frac{-1}{2},\frac{3}{2}\right]$

Domain of g= range of f

106. $\frac{1-x^2}{1+x^2}\geq 0$

$x^2-1\leq 0$

$x\in[-1,1]$

$D=[-1,1]$

$f(x)=\sqrt{1-\frac{2x^2}{1+x^2}}$

$f(x)=\sqrt{1-\frac{2}{x+\frac{1}{x}}}$

$range=[0,1]=G$

$D\cap G=[0,1]$

107. conceptual

108. Put $x=2$ or 3 we get minimum value

range $=[1,\infty)$

109. $([x]-x)(x-[x])\geq 0\ \&\ [x]\neq x$

The above is not possible

Domain $=\phi$

110. $x-[x]>0\ for\ x\in R-Z$

If $x\in R-Z$ then

$0<x-[x]<1$

$range=(1,\infty)$

111. $g\left(\frac{\pi}{2}\right)=\sin 2\times\frac{\pi}{12}$

$=\frac{1}{2}$

$f\left(\frac{1}{2}\right)=\left(\frac{1}{2}\right)^3-\frac{1}{2}=\frac{-3}{8}$

112. $\log_{10}\left(\frac{3-x}{x}\right)\geq 0,\quad \frac{3-x}{x}>0$

$\frac{3-x}{x}\geq 1 \qquad x(3-x)>0$

$x\leq\frac{3}{2} \qquad x(x-3)<0$

$x\in(0,3)$

C.S $\rightarrow\left(0,\frac{3}{2}\right]$

113. $f\left(\frac{2a}{1+a^2}\right)>0$

$\log\left(\frac{1-\frac{2a}{1+a^2}}{1+\frac{2a}{1+a^2}}\right)>0$

$\log\left(\frac{1-a}{1+a}\right)^2>0$

$\left(\frac{1-a}{1+a}\right)^2>1$

$\frac{(1-a)^2}{(1+a)^2}-1>0$

$\frac{-2a}{(1+a)^2}>0$

$\boxed{a<0},\ a\neq\{-1,1\}$

$a\in(-\infty,0)-\{-1\}$

114. CONCEPTUAL

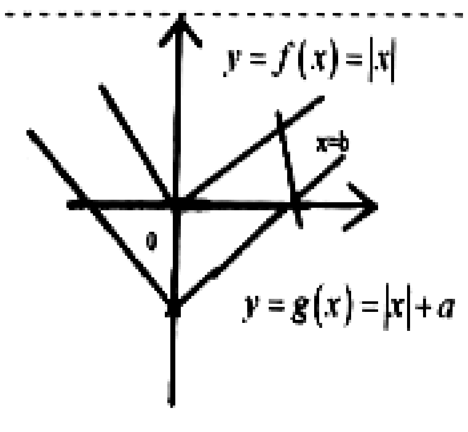
115. Given function $f(x)=\frac{2x+1}{3}$

$\frac{2\alpha+1}{3}=\frac{1}{\alpha}$

$2\alpha^2+\alpha-3=0$

Sum of all possible values α is $\frac{1}{2}$

116.



$y=f(x)=|x|$

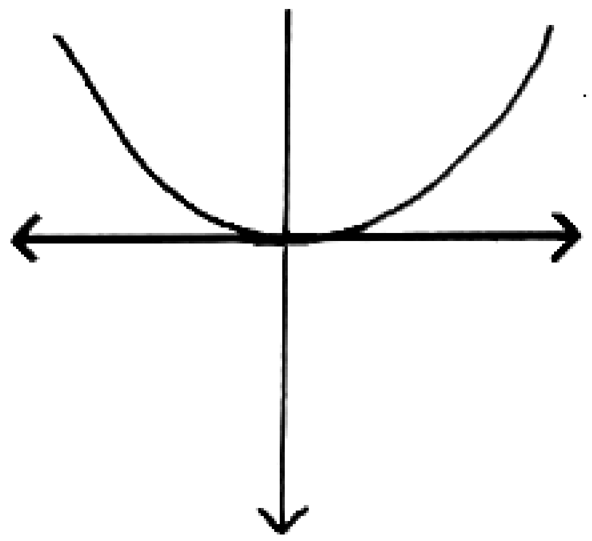
$y=g(x)=|x|+a$

From diagram form a " parallegram"

117. f(x)= x^2-3x+2

a=1 >0

Range = $\left[\frac{4ac^2-b^2}{4a},\infty\right)$ B = $\left[\frac{-1}{4},\infty\right)$



x= -b/2a = 3/2

f(x) is bijection if

$x\in(-\infty,3/2]=A$

(or)

$x\in[3/2,\infty)=A$

118. $f(x+y) = f(x)+f(y)$

$\Rightarrow f(x)=kx$

Given f(1)=7

$\Rightarrow k=7$

$\therefore f(x)=7x$

$\sum_{r=1}^{n} f(r)=7\sum_{r=1}^{n} r$

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

119. $n(A)=n$

No. of functions that are not one-one $=n^n-{}^nP_n$

$=n^n-n!$

120. $f(x)=\frac{|x|}{x}=\begin{cases}1 & ; & x>0\\ 0 & ; & x=0\\ -1 & ; & x<0\end{cases}$

$g(x)=1,\forall\in R$

By verification

$g(x)=\begin{cases}f(x)+2 & ; & x<0\\ 1+f(x) & ; & x=0\\ f(x) & ; & x>0\end{cases}$

121. f(3) =1

f(4)=2+1=3

f(5)=1+2=3

f(6)=3+1=4

f(7)=3+3=6

f(8)=4+3=7

f(9)=6+4=10

f(10)=7+6=13

122. $f(x)=\frac{1-\sin^2 x+\sin^4 x}{1-\cos^2 x+\cos^4 x}$

$=\frac{1-\sin^2 x\,(1-\sin^2 x)}{1-\cos^2 x(1-\cos^2 x)}$

$=\frac{1-\sin^2 x\cos^2 x}{1-\cos^2 x\sin^2 x}=1$

$f(2023)=1$

123. A= Domain=R

$x>1$	$x\le 1$
$3x>3$	$x^2\ge 0$
$3x-1>2$	$x^2+1\ge 1$

Range=$[1,\infty)=B$

$\therefore$ A-B=$(-\infty,1)$

124. $f(\sin 2x) > 0$

$(\sin 2x)^3 - \sin 2x > 0$

$(\sin 2x)(\sin^2 2x - 1) > 0$

$\sin 2x \cos^2 2x < 0$

$\sin 2x < 0 \ (\because \cos^2 2x > 0)$

$\pi < 2x < 2\pi$

$\frac{\pi}{2} < x < \pi$

$x \in \left(\frac{\pi}{2}, \frac{3\pi}{4}\right) \cup \left(\frac{3\pi}{4}, \pi\right)$

---

125. $f(x) = \sqrt{9 - x^2}$

$x^2 \geq 0$

$-x^2 \leq 0$

$9 - x^2 \leq 9$

$\sqrt{9 - x^2} \leq 3$

$Range = [0,3]$

---

126. $f(x) = x + \frac{1}{x} \quad (f(x))^2 = ?$

$(f(x))^2 = \left(x + \frac{1}{x}\right)^2$

$= x^2 + \frac{1}{x^2} + 2.x\frac{1}{x}$

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

Option verification

---

127. $y = 4x - 1$

$x = \frac{y+1}{4} > 3$

$\Rightarrow \boxed{y > 11}$

$y = x^2 - 2 \Rightarrow x = \sqrt{y+2}$

$0 \leq y + 2 \leq 9$

$\Rightarrow \boxed{y \leq 7}$

$y = 3x + 4$

$\Rightarrow x = \frac{y-4}{3} < -2$

$\Rightarrow \boxed{y < -2}$

$\therefore$ Range of f (x) $(-\infty, 7] \cup (11, \infty)$

---

128. $2^y = 2 - 2^x < 2$

$\Rightarrow 2^y < 2$

$\Rightarrow y < \log^2{}_2$

$\Rightarrow \boxed{y < 1}$

---

129. $(x^2 - 1)^2 + 2 \geq 2$

$\log_2\left((x^2 - 1)^2 + 2\right) \geq 1$

$-\log(x^2 - 2x^2 + 3) \leq -1$

$y = log_{0.5}(x^4 - 2x^2 + 3) \leq -1$

$y \in (-\infty, -1]$

---

130 Given $f(x) = -|x|$

Now $(fofof)(x) + (fofof)(-x)$

$= -|x| + (-|x|) = -2|x| = 2.f(x)$

---

131. $f(x) = (x-2)^2 + 1 \geq 1$

$Range = [1, \infty)$

---

132. $f(x) = \sin^{-1}\left(\log_2(x^2/2)\right)$

$-1 \leq \log_2 \frac{x^2}{2} \leq 1$

$\frac{1}{2} \leq \frac{x^2}{2} \leq 2$

$1 \leq x^2 \leq 4$

$|x|$ *lies b / w* 1 *and* 2

$1 \leq |x| \leq 2$

$\because$ *domain* $[-2, -1] \cup [1, 2]$

---

133. $f(x) = -\sqrt{-x^2 - 6x - 5}$

$-x^2 - 6x - 5 \geq 0$ $\qquad$ max *of* $f(x) = 0$

$x^2 + 6x + 5 \leq 0$ $\qquad$ min *of* $f(x) = -2$

$(x+1)(x+5) \leq 0$

domain $\qquad x \in [-1, -5]$

$\therefore$ *Range of* $f(x) = [-2, 0]$

134. $f: R \to R \qquad f(x) = 2x + \sin x, x \in R$

$f'(x) = 2 + \cos x$

$f'(x) > 0 \qquad \forall x \in R$

$f(x)$ is stricly increasing

$\therefore \qquad f(x)$ is $1-1$ and onto

135. $f(x) = 2x - 3$, if $x < -2$ $\quad f(x) = x^2 - 1$ if $-2 \le x \le 2$

$f(-3) = -9 \qquad f(-2) = 3$

$f(-4) = -11 \qquad f(2) = 3$

$f(x)$ is not a one –one

$f(x) \to$ Range $\neq$ codomain

$\therefore f(x)$ is neither injection nor surjection

136.Denominator: Numerator :

$[x]^2 - 5[x] + 6 > 0$

$([x]-2)([x]-3) > 0$

$(-\infty, 2) \cup [4, \infty)$

$\log_{10} \frac{x}{x-2} \ge 0$

$\frac{x}{x-2} \ge 1$

$x \ge x - 2$ (does not exist)

$\frac{x}{x-2} > 0$

$x > 0$

$\therefore \frac{Nr}{Dr} \Rightarrow [4, \infty)$

137. $f(x) = \frac{1}{x - |x|}$

$x - |x| \neq 0$

It is satisfied only when x<0

Range = $(-\infty, 0)$

138. $f(x) = \sqrt{16 - x^2}$; $f: [0,4] \to [0,4]$ onto

Let f(x)=y $\Rightarrow x = \sqrt{16 - y^2}$

By definition,

$y \in$ Codomain $\exists \sqrt{16 - y^2} \in$ Domain

$f\left(\sqrt{16-y^2}\right) = \sqrt{16 - \left(\sqrt{16-y^2}\right)^2}$

=y

$\therefore f(x)$ is onto

139. $f(x) = \frac{\sqrt{|x| - x}}{\sqrt{x - [x]}}$

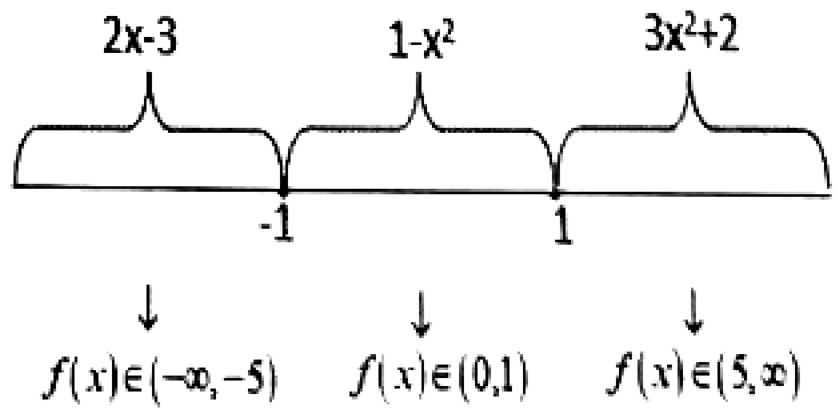
It is defined when

$|x| - x \ge 0$ and $x - [x] > 0$

$\lvert x \rvert \ge x$	$x > [x]$
$x \in R$	$x \in R - Z$

$\therefore$ Domain $\Rightarrow x \in R - Z$

140. $f(x) = \begin{cases} 2x-3, & x < -1 \\ 1 - x^2, & -1 \le x \le 1 \\ 3x^2 + 2, & x > 1 \end{cases}$



$\therefore$ Range $= (-\infty, -5) \cup [0, 1] \cup (5, \infty)$