EXERCISE-I

Definition of Function

1. Which of the following relation is a function?
(A) {(1,4), (2,6), (1,5), (3,9)}
(B) {(3,3), (2,1), (1,2), (2,3)}
(C) {(1,2), (2,2,), (3,2), (4,2)}
(D) {(3,1), (3,2), (3,3), (3,4)}

2. If x, y ∈ R, then which of the following rules is not a function-
(A) $y = 9 - x^2$ (B) $y = 2x^2$
(C) $y = \sqrt{x} - |x|$ (D) $y = x^2 + 1$

Domain, Co-domain & Range of Function

3. If $f(x) = \frac{x^2 - 1}{x^2 + 1}$, for every real numbers. then the minimum value of f
(A) Does not exist because f is bounded
(B) Is not attained even through f is bounded
(C) Is equal to +1
(D) Is equal to –1

4. The domain of the function $f(x) = \sin^{-1}[\log_2(x/2)]$ is
(A) [1, 4] (B) [–4, 1]
(C) [–1, 4] (D) None of these

5. The domain of $f(x) = \frac{\log_2(x+3)}{x^2 + 3x + 2}$ is
(A) $R - \{-1, -2\}$ (B) $(-2, +\infty)$
(C) $R - \{-1, -2, -3\}$ (D) $(-3, +\infty) - \{-1, -2\}$

6. The function $f(x) = \frac{\sec^{-1} x}{\sqrt{x - [x]}}$, where [.] denotes the greatest integer less than or equal to x is defined for all x belonging to
(A) R (B) $R - \{(-1, 1) \cup (n \mid n \in Z)\}$
(C) $R^+ - (0, 1)$ (D) $R^+ - \{n \mid n \in N\}$

7. If the domain of function $f(x) = x^2 - 6x + 7$ is $(-\infty, \infty)$, then the range of function is
(A) $(-\infty, \infty)$ (B) $[-2, \infty)$
(C) $(-2, 3)$ (D) $(-\infty, -2)$

8. The domain of the function $f(x) = \sqrt{\log \frac{1}{|\sin x|}}$ is
(A) $R - \{2n\pi, n \in I\}$ (B) $R - \{n\pi, n \in I\}$
(C) $R - \{-\pi, \pi\}$ (D) $(-\infty, \infty)$

9. The domain of the function $f(x) = \log(\sqrt{x-4} + \sqrt{6-x})$ is
(A) $[4, \infty)$ (B) $(-\infty, 6]$
(C) [4, 6] (D) None of these

10. Domain of the function $f(x) = \left[\log_{10}\left(\frac{5x - x^2}{4}\right)\right]^{1/2}$ is
(A) $-\infty < x < \infty$ (B) $1 \le x \le 4$
(C) $4 \le x \le 16$ (D) $-1 \le x \le 1$

11. The domain of the derivative of the function $f(x) = \begin{cases} \tan^{-1} x & , |x| \le 1 \\ \frac{1}{2}(|x| - 1) & , |x| > 1 \end{cases}$ is
(A) $R - \{0\}$ (B) $R - \{1\}$
(C) $R - \{-1\}$ (D) $R - \{-1, 1\}$

12. The domain of the function $f(x) = \log_{3+x}(x^2 - 1)$ is
(A) $(-3, -1) \cup (1, \infty)$
(B) $[-3, -1) \cup [1, \infty)$
(C) $(-3, -2) \cup (-2, -1) \cup (1, \infty)$
(D) $[-3, -2) \cup (-2, -1) \cup [1, \infty)$

13. If 'n' is an integer, the domain of the function $\sqrt{\sin 2x}$ is
(A) $\left[n\pi - \frac{\pi}{2}, n\pi\right]$ (B) $\left[n\pi, n\pi + \frac{\pi}{2}\right]$
(C) $[(2n-1)\pi, 2n\pi]$ (D) $[2n\pi, (2n+1)\pi]$

14. Domain of definition of the function $f(x) = \frac{3}{4 - x^2} + \log_{10}(x^3 - x)$, is
(A) (1, 2) (B) $(-1, 0) \cup (1, 2)$
(C) $(1, 2) \cup (2, \infty)$ (D) $(-1, 0) \cup (1, 2) \cup (2, \infty)$

15. Domain of the function $f(x)=\sqrt{2-2x-x^2}$ is

(A) $-\sqrt{3}\le x\le\sqrt{3}$ (B) $-1-\sqrt{3}\le x\le -1+\sqrt{3}$

(C) $-2\le x\le 2$ (D) $-2+\sqrt{3}\le x\le -2-\sqrt{3}$

16. Domain of the function $f(x)=\dfrac{x-3}{(x-1)\sqrt{x^2-4}}$ is

(A) (1, 2) (B) $(-\infty,-2)\cup(2,\infty)$

(C) $(-\infty,-2)\cup(1,\infty)$ (D) $(-\infty,\infty)-\{1,\pm 2\}$

17. Domain of the function $\sqrt{\log\{(5x-x^2)/6\}}$ is

(A) (2, 3) (B) [2, 3]

(C) [1, 2] (D) [1, 3]

18. Domain of the function $\sqrt{2-x}-\dfrac{1}{\sqrt{9-x^2}}$ is

(A) (–3, 1) (B) [–3, 1]

(C) (–3, 2] (D) [–3, 1)

19. The domain of the function $f(x)=\exp(\sqrt{5x-3-2x^2})$ is

(A) $\left[1,-\dfrac{3}{2}\right]$ (B) $\left[\dfrac{3}{2},\infty\right]$

(C) $[-\infty,1]$ (D) $\left[1,\dfrac{3}{2}\right]$

20. The domain of the function $f(x)=\dfrac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$ is

(A) [1, 2) (B) [2, 3)

(C) [1, 2] (D) [2, 3]

21. The range of $f(x)=\sec\left(\dfrac{\pi}{4}\cos^2 x\right), -\infty<x<\infty$ is

(A) $[1,\sqrt{2}]$ (B) $[1,\infty)$

(C) $[-\sqrt{2},-1]\cup[1,\sqrt{2}]$ (D) $(-\infty,-1]\cup[1,\infty)$

22. Range of the function $f(x)=\dfrac{x^2+x+2}{x^2+x+1}; x\in R$ is

(A) $(1,\infty)$ (B) $(1, 11/7]$

(C) $(1, 7/3]$ (D) $(1, 7/5]$

23. If $f(x)=a\cos(bx+c)+d$, then range of $f(x)$ is

(A) $[d+a, d+2a]$ (B) $[a-d, a+d]$

(C) $[d+a, a-d]$ (D) $[d-a, d+a]$

24. Range of $f(x)=[x]-x$ is

(A) [0, 1] (B) (–1, 0]

(C) R (D) (–1, 1)

25. The range of $f(x)=\cos(x/3)$ is

(A) $(-1/3, 1/3)$ (B) [–1, 1]

(C) $(1/3, -1/3)$ (D) (–3, 3)

26. The range of the function $f(x)=\dfrac{x+2}{|x+2|}$ is

(A) {0, 1} (B) {–1, 1}

(C) R (D) $R-\{-2\}$

27. The range of $f(x)=\cos x-\sin x$ is

(A) (–1, 1) (B) [–1, 1)

(C) $\left[-\dfrac{\pi}{2},\dfrac{\pi}{2}\right]$ (D) $[-\sqrt{2},\sqrt{2}]$

28. If $f:R\to R$, then the range of the function $f(x)=\dfrac{x^2}{x^2+1}$ is

(A) R^- (B) R^+

(C) R (D) $R\times R$

29. The interval for which $\sin^{-1}\sqrt{x}+\cos^{-1}\sqrt{x}=\dfrac{\pi}{2}$ holds

(A) $[0,\infty)$ (B) [0, 3]

(C) [0, 1] (D) [0, 2]

30. Function $\sin^{-1}\sqrt{x}$ is defined in the interval

(A) (–1, 1) (B) [0, 1]

(C) [–1, 0] (D) (–1, 2)

31. The function $f:R\to R$ is defined by $f(x)=\cos^2 x+\sin^4 x$ for $x\in R$, then R_f =

(A) $\left(\dfrac{3}{4},1\right]$ (B) $\left[\dfrac{3}{4},1\right)$

(C) $\left[\dfrac{3}{4},1\right]$ (D) $\left(\dfrac{3}{4},1\right)$

32. If x is real, then value of the expression $\dfrac{x^2+14x+9}{x^2+2x+3}$ lies between

(A) 5 and 4 (B) 5 and –4

(C) – 5 and 4 (D) None of these

33. For $\theta > \frac{\pi}{3}$, the value of $f(\theta) = \sec^2\theta + \cos^2\theta$ always lies in the interval

(A) (0, 2) (B) [0, 1]

(C) (1, 2) (D) $[2, \infty)$

Types of Functions

34. The graph of the function $y = f(x)$ is symmetrical about the line $x = 2$, then

(A) $f(x) = -f(-x)$ (B) $f(2+x) = f(2-x)$

(C) $f(x) = f(-x)$ (D) $f(x+2) = f(x-2)$

35. $f(x, y) = \frac{1}{x+y}$ is a homogeneous function of degree

(A) 1 (B) –1

(C) 2 (D) –2

Even / Odd Functions

36. The function $f(x) = \frac{\sin^4 x + \cos^4 x}{x + \tan x}$ is -

(A) odd

(B) Even

(C) neither even nor odd

(D) odd and periodic

37. A function is called even function if its graph is symmetrical w.r.t.-

(A) origin (B) x = 0

(C) y = 0 (D) line y = x

38. The even function is-

(A) $f(x) = x^2(x^2+1)$ (B) $f(x) = \sin^3 x + 2$

(C) $f(x) = x(x+1)$ (D) $f(x) = \tan x + c$

39. Which of the following is an even function ?

(A) $x\frac{a^x - 1}{a^x + 1}$ (B) tan x

(C) $\frac{a^x - a^{-x}}{2}$ (D) $\frac{a^x + 1}{a^x - 1}$

40. In the following, odd function is -

(A) $\cos x^2$ (B) $(e^x + 1)/(e^x - 1)$

(C) $x^2 - |x|$ (D) None of these

41. The function $f(x) = x^2 - |x|$ is -

(A) an odd function

(B) a rational function

(C) an even function

(D) None of these

42. Which of the following function is even function

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

(C) $f(x) = \frac{a^x - a^{-x}}{a^x + a^{-x}}$ (D) $f(x) = \sin x$

43. If $f(x) = \log\frac{1+x}{1-x}$, then $f(x)$ is

(A) Even function (B) $f(x_1)f(x_2) = f(x_1 + x_2)$

(C) $\frac{f(x_1)}{f(x_2)} = f(x_1 - x_2)$ (D) Odd function

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

(A) Even function

(B) Odd function

(C) Neither even nor odd

(D) Periodic function

45. The function $f(x) = \log(x + \sqrt{x^2+1})$, is

(A) An even function

(B) An odd function

(C) A Periodic function

(D) Neither an even nor odd function

Periodic Function

46. The period of $\sin^4 x + \cos^4 x$ is -

(A) π (B) π/2

(C) 2π (D) None of these

47. The period of function $|\cos 2x|$ is -

(A) π (B*) π/2

(C) 4π (D) 2π

48. The period of function $\sin\left(\frac{\pi x}{2}\right) + \cos\left(\frac{\pi x}{2}\right)$ is-

(A) 4 (B) 6

(C) 12 (D) 24

49. The period of the function $f(x) = \log \cos 2x + \tan 4x$ is -

(A) $\pi/2$ (B) π

(C) 2π (D) $2\pi/5$

50. The period of the function $f(x) = 2\cos\frac{1}{3}(x-\pi)$ is -

(A) 6π (B) 4π

(C) 2π (D) π

51. In the following which function is notperiodic-

(A) tan 4x (B) cos 2πx

(C) cos x^2 (D) $\cos^2 x$

Value of the Function

52. If f(x) = log x, then correct statement is-

(A) f(x + y) = f(x) + f(y)

(B) f(x + y) = f(x) . f(y)

(C) f(xy) = f(x) + f(y)

(D) f(xy) = f(x) . f(y)

53. If $f(x) = \frac{x}{x+1}$, then $= \frac{f(a/b)}{f(b/a)}$

(A) ab (B) a/b

(C) b/a (D) 1

54. If $f(x) = \frac{b(x-a)}{(b-a)} + \frac{a(x-b)}{(a-b)}$, then f(a + b) =

(A) f(a). f(b) (B) f(a) – f(b)

(C) f(a) /f(b) (D) f(a) + f(b)

55. If $f(x) = \frac{x(x-1)}{2}$, then the value of f (x + 2) is-

(A) f (x) + f(x + 1) (B) $\frac{(x+2)}{x}$ f(x + 1)

(C) $\frac{(x+1)}{2}$ f(x +1) (D) $\frac{(x+2)}{2}$ f(x +1)

56. If $f : N \to R^+$, $f(x) = \sqrt{x}$, then the value of $\frac{f(25)}{f(9)+f(16)}$ is -

(A) 0 (B) 1

(C) 5/7 (D) 9/7

57. If f(x) = (ax – c)/(cx – a) = y, then f(y) equals-

(A) x (B) 1/x

(C) 1 (D) 0

58. If $f(x+ay, x-ay) = axy$, then $f(x, y)$ is equal to

(A) xy (B) $x^2 - a^2y^2$

(C) $\frac{x^2-y^2}{4}$ (D) $\frac{x^2-y^2}{a^2}$

59. If $f(x) = \cos[\pi^2]x + \cos[-\pi^2]x$, then

(A) $f\left(\frac{\pi}{4}\right) = 2$ (B) $f(-\pi) = 2$

(C) $f(\pi) = 1$ (D) $f\left(\frac{\pi}{2}\right) = -1$

60. If $f(x) = \frac{1}{\sqrt{x+2\sqrt{2x-4}}} + \frac{1}{\sqrt{x-2\sqrt{2x-4}}}$ for $x > 2$, then $f(11) =$

(A) 7/6 (B) 5/6

(C) 6/7 (D) 5/7

61. If $f(x) = \frac{x}{x-1} = \frac{1}{y}$, then $f(y) =$

(A) x (B) $x+1$

(C) $x-1$ (D) $1-x$

62. If $y = f(x) = \frac{ax+b}{cx-a}$, then x is equal to

(A) $1/f(x)$ (B) $1/f(y)$

(C) $yf(x)$ (D) $f(y)$

Mapping

63. Which of the four statements given below is different from others

(A) $f : A \to B$

(B) $f : x \to f(x)$

(C) f is a mapping of A into B

(D) f is a function of A into B

64. Let $f : N \to N$ defined by $f(x) = x^2 + x + 1$, $x \in N$, then f is

(A) One-one onto (B) Many one onto

(C) One-one but not onto (D) None of these

65. Let X and Y be subsets of R, the set of all real numbers. The function $f : X \to Y$ defined by $f(x) = x^2$ for $x \in X$ is one-one but not onto if (Here R^+ is the set of all positive real numbers)

(A) $X = Y = R^+$ (B) $X = R, Y = R^+$

(C) $X = R^+, Y = R$ (D) $X = Y = R$

66. Set A has 3 elements and set B has 4 elements. The number of injection that can be defined from A to B is

(A) 144 (B) 12

(C) 24 (D) 64

67. Let $f : R \to R$ be a function defined by $f(x) = \frac{x-m}{x-n}$, where $m \neq n$. Then

(A) f is one-one onto (B) f is one-one into

(C) f is many one onto (D) f is many one into

68. The function $f : R \to R$ defined by $f(x) = e^x$ is

(A) Onto

(B) Many-one

(C) One-one and into

(D) Many one and onto

69. Which one of the following is a bijective function on the set of real numbers

(A) $2x - 5$ (B) $|x|$

(C) x^2 (D) $x^2 + 1$

70. Let $f(x) = \frac{x^2 - 4}{x^2 + 4}$ for $|x| > 2$, then the function $f : (-\infty, -2] \cup [2, \infty) \to (-1, 1)$ is

(A) One-one into (B) One-one onto

(C) Many one into (D) Many one onto

71. Let the function $f : R \to R$ be defined by $f(x) = 2x + \sin x, x \in R$. Then f is

(A) One-to-one and onto

(B) One-to-one but not onto

(C) Onto but not one-to-one

(D) Neither one-to-one nor onto

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

(A) One-one but not onto

(B) Onto but not one-one

(C) One-one and onto both

(D) Neither one-one nor onto

73. If $f : [0, \infty) \to [0, \infty)$ and $f(x) = \frac{x}{1+x}$, then f is

(A) One-one and onto

(B) One-one but not onto

(C) Onto but not one-one

(D) Neither one-one nor onto

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

(A) [–1, 3] (B) [1, 1]

(C) [0, 1] (D) [0, –1]

75. If R denotes the set of all real numbers then the function $f : R \to R$ defined $f(x) = [x]$

(A) One-one only

(B) Onto only

(C) Both one-one and onto

(D) Neither one-one nor onto

76. $f(x)=x+\sqrt{x^2}$ is a function from $R\to R$, then $f(x)$ is

(A) Injective (B) Surjective

(C) Bijective (D) None of these

77. If $(x,y)\in R$ and $x, y\neq 0$; $f(x,y)\to\frac{x}{y}$, then this function is a/an

(A) Surjection (B) Bijection

(C) One-one (D) None of these

Composite Functions

78. If $e^{f(x)}=\frac{10+x}{10-x}, x\in(-10,10)$ and $f(x)=kf\left(\frac{200x}{100+x^2}\right)$, then $k=$

(A) 0.5 (B) 0.6

(C) 0.7 (D) 0.8

79. If $f(x)=2\sin x$, $g(x)=\cos^2 x$, then $(f+g)\left(\frac{\pi}{3}\right)=$

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

(C) $\sqrt{3}+\frac{1}{4}$ (D) None of these

80. If $f(x)=\log_a x$ and $F(x)=a^x$, then $F[f(x)]$ is

(A) $f[F(x)]$ (B) $f[F(2x)]$

(C) $F\,|f(2x)|$ (D) $F[(x)]$

81. Let f and g be functions defined by $f(x)=\frac{x}{x+1}$, $g(x)=\frac{x}{1-x}$, then $(fog)(x)$ is

(A) $\frac{1}{x}$ (B) $\frac{1}{x-1}$

(C) $x-1$ (D) x

82. If from $R\to R$, $f(x)=(x+1)^2$, $g(x)=x^2+1$, then $(fog)(-3)$ equals

(A) 121 (B) 112

(C) 211 (D) None of these

83. Suppose that $g(x)=1+\sqrt{x}$ and $f(g(x))=3+2\sqrt{x}+x$, then $f(x)$ is

(A) $1+2x^2$ (B) $2+x^2$

(C) $1+x$ (D) $2+x$

84. The composite mapping fog of the map $f:R\to R$, $f(x)=\sin x$, $g:R\to R$, $g(x)=x^2$ is

(A) $\sin x+x^2$ (B) $(\sin x)^2$

(C) $\sin x^2$ (D) $\frac{\sin x}{x^2}$

85. Let $f(x)=ax+b$ and $g(x)=cx+d, a\neq 0, c\neq 0$. Assume $a=1, b=2$. If $(fog)(x)=(gof)(x)$ for all x, what can you say about c and d

(A) c and d both arbitrary (B) $c=1$, d arbitrary

(C) c arbitrary, $d=1$ (D) $c=1, d=1$

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

(A) $\sqrt{2}$ (B) $-\sqrt{2}$

(C) 1 (D) -1

87. If $f(x)=\frac{2x+1}{3x-2}$, then $(fof)(2)$ is equal to

(A) 1 (B) 3

(C) 4 (D) 2

88. If $f(x)=\sin^2 x$ and the composite function $g\{f(x)\}=|\sin x|$, then the function $g(x)$ is equal to

(A) $\sqrt{x-1}$ (B) $\sqrt{x}$

(C) $\sqrt{x+1}$ (D) $-\sqrt{x}$

Inverse of a Functions

89. If f : R $\to$ R, f(x) = x^2 + 3, then pre- image of 2 under f is -

(A) {1,–1} (B) {1}

(C) {–1} (D) ϕ

90. Which of the following functions has its inverse-

(A) $f : R \to R$, $f(x) = a^x$

(B) $f : R \to R$, $f(x) = |x| + |x - 1|$

(C) $f : R_0 \to R^+$, $f(x) = |x|$

(D) $f : [\pi, 2\pi] \to [-1,1]$, $f(x) = \cos x$

91. The inverse of the function $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} + 2$ is given by -

(A) $\log\left(\frac{x-2}{x-1}\right)^{1/2}$ (B) $\log\left(\frac{x-1}{x+1}\right)^{1/2}$

(C) $\log\left(\frac{x}{2-x}\right)^{1/2}$ (D) $\log\left(\frac{x-1}{3-x}\right)^{1/2}$

92. If $f : [1, \infty) \to [2, \infty)$ is given by $f(x) = x + \frac{1}{x}$ then $f^{-1}(x)$ equals -

(A) $\frac{x + \sqrt{x^2 - 4}}{2}$ (B) $\frac{x}{1 + x^2}$

(C) $\frac{x - \sqrt{x^2 - 4}}{2}$ (D) $1 + \sqrt{x^2 - 4}$

93. If $f(x) = x^3 - 1$ and domain of $f = \{0,1,2,3\}$, then domain of f^{-1} is -

(A) $\{0,1,2,3\}$

(B) $\{1,0,-7,-26\}$

(C) $\{-1,0,7,26\}$

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

94. If $f(x) = \{4 - (x - 7)^3\}^{1/5}$, then its inverse is-

(A) $7 - (4 - x^5)^{1/3}$

(B) $7 - (4 + x^5)^{1/3}$

(C) $7 + (4 - x^5)^{1/3}$

(D) None of these

95. If $f : R \to R$, $f(x) = e^x$ and $g : R \to R$, $g(x) = 3x - 2$, then the value of $(fog)^{-1}(x)$ is equal to

(A) $\log(x - 2)$ (B) $\frac{2 + \log x}{3}$

(C) $\log\left(\frac{x+3}{2}\right)$ (D) None of these

96. Which of the following function is invertible

(A) $f(x) = 2^x$ (B) $f(x) = x^3 - x$

(C) $f(x) = x^2$ (D) None of these