Multiple Choice Questions

[MHT-CET 2022]
(online shift)
(Memory Based Questions)

1. The domain of the definition of the function $F(x) = \frac{1}{4-x^2} + \log_{10}(x^3 - x)$ is

   a) $(-1, 0) \cup (1, 2) \cup (3, \infty)$
   b) $(-2, -1) \cup (-1, 0) \cup (2, \infty)$
   c) $(-1, 0) \cup (1, 2) \cup (2, \infty)$
   d) $(1, 2) \cup (2, \infty)$

2. Let $f : R \longrightarrow R$ be a differentiable function with $f(0) = 1$ and satisfying the equation $f(x+y) = f(x).f^1(y) + f^1(x).f(y), \forall x, y \in R$, then the value of $\log(f(4))$ is

   a) $\frac{1}{2}$
   b) 2
   c) 4
   d) 1

3. The domain of the derivative of the function $f(x) = \begin{cases} \tan^{-1} x & if\ |x| \le 1 \\ \frac{1}{2}(|x|-1) & if\ |x| > 1 \end{cases}$

   a) $R - \{-1, 1\}$
   b) $R - \{-1\}$
   c) $R - \{0\}$
   d) $R - \{1\}$

4. If $f(x) = [x] - \left[\frac{x}{4}\right], x \in R$, where $[x]$ denotes the greatest integer less than or equal to x, then

   a) Both $\lim\limits_{x \to 4^-} f(x)$ and $\lim\limits_{x \to 4^+} f(x)$ exist but are not equal
   b) $\lim\limits_{x \to 4^+} f(x)$ exists but $\lim\limits_{x \to 4^-} f(x)$ does not exist.
   c) $f(x)$ continuous at $x = 4$
   d) $\lim\limits_{x \to 4^-} f(x)$ exists, but $\lim\limits_{x \to 4^+} f(x)$ does not exist.

5. The function $f(x) = \frac{\log(\pi + x)}{\log(e + x)}$ is

   a) decreasing on $(0, \infty)$
   b) decreasing on $\left(0, \frac{\pi}{e}\right)$, increasing on $\left(\frac{\pi}{e}, \infty\right)$
   c) increasing on $(0, \infty)$
   d) increasing on $\left(0, \frac{\pi}{e}\right)$, decreasing on $\left(\frac{\pi}{e}, \infty\right)$

. For a suitable real constant a, let a function $f : R - \{-a\} \longrightarrow R$ be defined by $f(x) = \frac{a-x}{a+x}$. Further, suppose that for any real number $x \ne -a$ and $f(x) \ne -a$, $fof(x) = x$. Then $f\left(-\frac{1}{2}\right)$ is equal to

   a) $\frac{1}{3}$
   b) 3
   c) -3
   d) $-\frac{1}{3}$

14. The domain of the function

$f(x) = \sqrt{x-1} + \sqrt{6-x}$ is

a) $[1, \infty)$ b) $[1, 6]$ c) $(-\infty, 6)$ d) $(-\infty, 6]$

15. If $f(x) = \frac{x}{2x+1}$ and $g(x) = \frac{x}{x+1}$ then $(fog)\, x = \ldots\ldots$

a) $\frac{2x-1}{x+1}$ b) $\frac{x}{3x+1}$ c) $\frac{x+1}{x+2}$ d) $\frac{x-1}{2x+1}$

16. If $f(x) = 2\{x\} + 5x$, where $\{x\}$ is fractional part function, then $f(-1.4)$ is

a) 8.2 b) -8.2 c) -5.8 d) -5

17. If $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right)$ and $g\left(\frac{5}{4}\right) = 1$, then $(gof)x$ is equal to

a) 1 b) -1 c) 2 d) -2

18. Range of the function $f(x) = \frac{x}{1+x^2}$ is

a) $(-\infty, \infty)$ b) $[-1, 1]$ c) $\left[-\frac{1}{2}, \frac{1}{2}\right]$ d) $\left[-\sqrt{2}, \sqrt{2}\right]$

19. The domain of $f(x) = \sin^{-1}\left[\log_2\left(\frac{x}{2}\right)\right]$ is

a) $0 \le x \le 1$ b) $0 \le x \le 4$ c) $1 \le x \le 4$ d) $4 \le x \le 6$

20. The inverse of $f(x) = \frac{2}{3}\left(\frac{10^x - 10^{-x}}{10^x + 10^{-x}}\right)$ is

a) $\frac{1}{3}\log_{10}\frac{1+x}{1-x}$ b) $\frac{1}{2}\log_{10}\frac{2+3x}{2-3x}$ c) $\frac{1}{3}\log_{10}\frac{2+3x}{2-3x}$ d) $\frac{1}{6}\log_{10}\frac{2-3x}{2+3x}$

[MHT-CET 2020]
(online shift)
(Memory Based Questions)

21. If $f: R \longrightarrow R$ is given by $f(x) = 7x + 8$ and $f^{-1}(12) = \frac{K}{7}$, then the value of K is

a) 1 b) 7 c) 4 d) 8

22. If $f(x) = \frac{4x+7}{7x-4}$ then the value of $f\{f[f(2)]\} = \ldots\ldots$

a) $\frac{35}{39}$ b) $\frac{2}{3}$ c) $\frac{3}{2}$ d) $\frac{39}{35}$

23. If $f: R \longrightarrow R$, $g: R \longrightarrow R$ are two functions defined by $f(x) = 2x - 3$, $g(x) = x^3 + 5$, then $(fog)^{-1} x = \ldots\ldots$

a) $\left(\frac{2x+3}{2}\right)^{\frac{1}{2}}$ b) $\left(\frac{x-7}{2}\right)^{\frac{1}{3}}$ c) $\left(\frac{x+7}{2}\right)^{\frac{1}{3}}$ d) $\left(\frac{x-7}{2}\right)^{\frac{1}{2}}$

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

a) $[2, 3]$ b) $(2, 3]$ c) $[2, 3)$ d) $(2, 3)$

35. The range of function $f(x) = \sin x + \operatorname{cosec} x$ is

a) $[-1, 1]$ b) $(-1, 1)$ c) $R - [-2, 2]$ d) $R - (-2, 2)$

36. Function $f : R \longrightarrow R$ defined by $f(x) = x^2 + 5$ is

a) many – one and onto
b) one – one and onto
c) onto
d) many – one and into

37. Function $f : R \longrightarrow R$ is defined by $f(x) = |x| + x$. Which of the following statements is true ?

a) f is many – one
b) f is constant function
c) f is one – one
d) f is onto

38. If $f(x) = x^2 + 1$, then $f(f(x)) =$ ......

a) $x^4 - x^2 - 2$ b) $x^4 + 1$ c) $x^4 + 2x^2 + 2$ d) $x^4 + x^2 + 2$

39. The range of the function $f(x) = \frac{1}{\sqrt{x^2 - 9}}$, $x \in (3, \infty)$ is

a) $(-3, 3)$ b) $[-3, 3)$ c) $(3, \infty)$ d) $(0, \infty)$

[MHT-CET 2018]

40. If $f : R - \{2\} \longrightarrow R$ is a function defined by $f(x) = \frac{x^2 - 4}{x - 2}$, then its image is

a) R b) $R - \{2\}$ c) $R - \{4\}$ d) $R - \{-2, 2\}$

[MHT-CET 2023]

41. If $f = \{(ab, a + b) : a, b \in Z\}$, then

a) f is surjective function from Z to Z
b) f is injective function from Z to Z
c) f is a function from Z to Z
d) f is not a function from Z to Z

42. If $3f(x) - f\left(\frac{1}{x}\right) = 8 \log_2 x^3$, $x > 0$, then $f(2), f(4), f(8)$ are in

a) AP b) GP c) HP d) AGP

43. The domain of the function $f(x) = \sin^{-1}\left(\frac{|x|+5}{x^2+1}\right)$ is $(-\infty, -a] \cup [a, \infty)$. Then $a =$

a) $\frac{\sqrt{17}-1}{2}$ b) $\frac{\sqrt{17}+1}{2}$ c) $\frac{\sqrt{17}}{2} - 1$ d) $\frac{\sqrt{17}}{2} + 1$

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

a) $(0, 1)$ b) $(0, 1]$ c) $[0, 1)$ d) $[0, 1]$

57. If the domain of the function $f(x) = \frac{\sqrt{x^2 - 25}}{4 - x^2} + \log_{10}(x^2 + 2x - 15)$ is $(-\infty, \alpha) \cup [\beta, \infty)$, then $\alpha^2 + \beta^3 =$

a) 125 b) 150 c) 140 d) 175

58. The domain of definition of $f(x) = \frac{\log_2(x+3)}{x^2 + 3x + 2}$ is

a) $(-2, \infty)$ b) $R - \{-1, -2, -3\}$ c) $R - \{1, 2\}$ d) $(-3, \infty) - \{-1, -2\}$

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

a) $\left(1, \frac{7}{3}\right)$ b) $\left(1, \frac{7}{3}\right]$ c) $\left[1, \frac{7}{3}\right)$ d) $\left[1, \frac{7}{3}\right]$

60. Let $f(x) = \frac{1}{7 - \sin 5x}$ be a function defined on R. Then the range of the function $f(x)$ is equal to

a) $\left[\frac{1}{8}, \frac{1}{5}\right]$ b) $\left[\frac{1}{7}, \frac{1}{6}\right]$ c) $\left[\frac{1}{7}, \frac{1}{5}\right]$ d) $\left[\frac{1}{8}, \frac{1}{6}\right]$

61. Let the range of the function $f(x) = \frac{1}{2 + \sin 3x + \cos 3x}$, $x \in IR$ be $[a, b]$. If α and β are respectively the A.M. and the G.M. of a and b, then $\frac{\alpha}{\beta} =$

a) 2 b) π c) $\sqrt{2}$ d) $\sqrt{\pi}$

62. If $f(x) = \frac{x}{2 - x}$, $g(x) = \frac{x+1}{x+2}$, then $(gogof)(x) =$

a) $\frac{6-x}{10-2x}$ b) $\frac{6-x}{10+2x}$ c) $\frac{6+x}{10-2x}$ d) $\frac{6+x}{10+2x}$

63. If $f(x) = \frac{ax}{x+1}$, $x \neq 1$ and $f(f(x)) = x$, then $a =$ 4]

a) -1 b) 1 c) $\sqrt{2}$ d) $-\sqrt{2}$

64. For a suitable chosen real constant a, let a function $f: R - \{-a\} \to R$ be defined by $f(x) = \frac{a-x}{a+x}$. Further, suppose that for any real number $x \neq -a$ and $f(x) \neq -a$, $fof(x) = x$. Then $f\left(-\frac{1}{2}\right) =$

a) -3 b) 3 c) $-\frac{1}{3}$ d) $\frac{1}{3}$

65. If $g(x) = x^2 + x - 1$ and $gof(x) = 4x^2 - 10x + 5$, then $f(2) =$

a) -1 b) 0 c) 1 d) 2

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

a) $1 + \sqrt{x^2 - 4}$ b) $\frac{2}{1 + x^2}$ c) $\frac{x + \sqrt{x^2 - 4}}{2}$ d) $\frac{x - \sqrt{x^2 - 4}}{2}$