

# MISSION NDA MATHEMATICS

## COMPLETE TOPICWISE QUESTIONS

### FUNCTION

- The range of  $f(x) = \sin^{-1}(\sqrt{x^2 + x + 1})$  is  
 (a)  $(0, \frac{\pi}{2}]$  (b)  $(0, \frac{\pi}{3}]$   
 (c)  $[\frac{\pi}{3}, \frac{\pi}{2}]$  (d)  $[\frac{\pi}{6}, \frac{\pi}{3}]$
- The domain of the function  $f(x) = \sqrt{\log_{0.5} x}$  is  
 (a)  $(0, 1]$  (b)  $(0, \infty)$   
 (c)  $(0.5, \infty)$  (d)  $[1, \infty)$
- The domain of the function  $f(x) = \frac{1}{1-x} + 2^{\sin^{-1} x} + \frac{1}{\sqrt{x-2}}$  is  
 (a)  $(-\infty, \infty) - \{1\}$  (b)  $(2, \infty)$   
 (c)  $[-1, 1)$  (d)  $\phi$
- The period of the function  $\left| \sin^3 \frac{x}{2} \right| + \left| \cos^5 \frac{x}{5} \right|$  is  
 (a)  $2\pi$  (b)  $10\pi$   
 (c)  $8\pi$  (d)  $5\pi$
- The function  $f(x) = \sin\left(\frac{\pi x}{n!}\right) - \cos\left(\frac{\pi x}{(n+1)!}\right)$  is  
 (a) not periodic (b) periodic, with period  $2n!$   
 (c) periodic, with period  $(n+1)$  (d) none of these
- The domain of  $f(x) = \sqrt{\frac{1-|x|}{2-|x|}}$  is  
 (a)  $(-\infty, \infty) - [-2, 2]$  (b)  $(-\infty, \infty) - [-1, 1]$   
 (c)  $[-1, 1] \cup (-\infty, -2) \cup (2, \infty)$  (d) none of these
- The range of  $f(x) = 3 \tan \sqrt{\frac{\pi^2}{9} - x^2}$  is  
 (a)  $[-3\sqrt{3}, 3\sqrt{3}]$  (b)  $[0, \sqrt{3}]$   
 (c)  $[0, 3\sqrt{3}]$  (d) none of these
- The domain of the function  $f(x) = \cos^{-1}\left(\frac{3}{4+2\sin x}\right)$  is  
 (a)  $\left[-\frac{\pi}{6} + 2n\pi, \frac{7\pi}{6} + 2n\pi\right]$  (b)  $\left(-\frac{\pi}{6} + 2n\pi, \frac{7\pi}{6} + 2n\pi\right)$   
 (c)  $\left[-\frac{\pi}{6} + 2n\pi, \frac{7\pi}{6} + 2n\pi\right]$  (d)  $\left[-\frac{\pi}{6} + 2n\pi, \frac{7\pi}{6} + 2n\pi\right)$
- The domain of the function  $f(x) = \sqrt[3]{1-3x} + 3\cos^{-1}\left(\frac{2x-1}{3}\right) + e^{3\tan x}$  is



- (a)  $[-1, 2] - \left\{\frac{\pi}{2}\right\}$  (b)  $(-1, 2)$   
 (c)  $(-\infty, \infty)$  (d) none of these
10. The range of the function  $y = \sin [x]$  for all  $x \in \left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$ , when  $[x]$  denotes the greatest integer less than and equal to  $x$ , is  
 (a)  $\{0\}$  (b)  $\{0, -1\}$   
 (c)  $\{0, \pm \sin 1\}$  (d)  $\{0, -\sin 1\}$
11. The inverse of the function  $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} + 2$  is given by  
 (a)  $\log_e \left(\frac{x+2}{x-1}\right)^{1/2}$  (b)  $\log_e \left(\frac{x-1}{3-x}\right)^{1/2}$   
 (c)  $\log_e \left(\frac{x}{2-x}\right)^{1/2}$  (d)  $\log_e \left(\frac{x-1}{x+1}\right)^{-2}$
12. If  $A = \left\{x: \frac{\pi}{6} \leq x \leq \frac{\pi}{3}\right\}$  and  $f(x) = \cos x - x(1+x)$ , then  $f(A)$  is equal to  
 (a)  $\left[\frac{1}{2} - \frac{\pi}{3} - \frac{\pi^2}{9}, \frac{\sqrt{3}}{2} - \frac{\pi}{6} - \frac{\pi^2}{36}\right]$  (b)  $\left[\frac{1}{2} + \frac{\pi}{3} - \frac{\pi^2}{9}, \frac{\sqrt{3}}{2} + \frac{\pi}{6} - \frac{\pi^2}{36}\right]$   
 (c)  $\left(\frac{1}{2} - \frac{\pi}{3} - \frac{\pi^2}{9}, \frac{\sqrt{3}}{2} - \frac{\pi}{6} - \frac{\pi^2}{36}\right)$  (d) none of these
13. Which one of the following is periodic?  
 (a)  $f(x) = x - [x]$ , where  $[x] \leq x$  (b)  $f(x) = x \sin (1/x)$  for  $x \neq 0, f(0) = 0$   
 (c)  $f(x) = x \cos x$  (d) none of these
14. The range of the function  $f(x) = \sqrt{\frac{x}{1+x}}$  is  
 (a)  $(0, \infty)$  (b)  $[0, \infty)$   
 (c)  $[0, \infty) - \{1\}$  (d) none of these
15. Let  $f(x) = \sin^2 \frac{x}{2} + \cos^2 \frac{x}{2}$  and  $g(x) = \sec^2 x - \tan^2 x$ . The two functions are equal over the set  
 (a)  $\phi$  (b)  $\mathbb{R}$   
 (c)  $\mathbb{R} - \left\{x: x = (2n+1)\frac{\pi}{2}; n \in I\right\}$  (d) none of these
16. The domain of the function  $f(x) = \frac{1}{1+2\sin x}$  is  
 (a)  $\mathbb{R}$  (b)  $\mathbb{R} - \left\{n\pi + (-1)^n \frac{5\pi}{6}, n \in Z\right\}$   
 (c)  $\mathbb{R} - \left\{n\pi + (-1)^n \frac{11\pi}{6}, n \in Z\right\}$  (d) none of these
17. If  $f(x+1) + f(x-1) = 2f(x)$  and  $f(0) = 0$ , then  $f(n), n \in N$ , is  
 (a)  $nf(1)$  (b)  $[f(1)]^n$   
 (c) 0 (d) none of these
18. If  $f(x) = \frac{x}{x-1} = \frac{1}{y}$ , then the value of  $f(y)$  is  
 (a)  $x$  (b)  $x-1$   
 (c)  $1-x$  (d)  $1+x$
19. The domain of the function  $y = \cos^{-1} \left(\frac{1+x^4}{2x^2}\right) + \sqrt{x(x+2)}$  is  
 (a)  $[-1, 1]$  (b)  $(-1, 1)$   
 (c)  $\{-1, 1\}$  (d)  $\{1\}$



20. The range of the function  $f(x) = 3|\sin x| - 2|\cos x|$  is  
 (a)  $[-2, \sqrt{13}]$  (b)  $[-2, 3]$   
 (c)  $[3, \sqrt{13}]$  (d) none of these
21. Let  $f$  be a function satisfying  $f(x + y) = f(x) + f(y)$  for all  $x, y \in \mathbb{R}$ . If  $f(1) = k$ , then  $f(n), n \in \mathbb{N}$ , is equal to  
 (a)  $k^n$  (b)  $nk$   
 (c)  $-k^n$  (d) none of these
22. If  $f(x) = \frac{1-x}{1+x}$ , then the value of  $f[f(\cos 2\theta)]$  is  
 (a)  $\tan 2\theta$  (b)  $\sec 2\theta$   
 (c)  $\cos 2\theta$  (d)  $\cot 2\theta$
23. The domain of  $f(x) = \frac{\log_2(x+3)}{x^2+3x+2}$  is  
 (a)  $\mathbb{R} - \{-1, -2\}$  (b)  $(-2, \infty)$   
 (c)  $\mathbb{R} - \{-1, -2, -3\}$  (d)  $(-3, \infty) - \{-1, -2\}$
24. The domain of the definition of  $f(x) = \log_2 [1 - \log_2 (x^2 - 5x + 8)]$  is  
 (a)  $(1, 3)$  (b)  $(2, 3)$   
 (c)  $[2, 3]$  (d) none of these
25. The largest set of real values of  $x$  for which  $f(x) = \sqrt{(x+2)(5-x)} - \frac{1}{\sqrt{x^2-4}}$  is a real function is  
 (a)  $[1, 2) \cup (2, 5]$  (b)  $(2, 5]$   
 (c)  $[3, 4]$  (d) none of these
26. If  $g(x) = 1 + \sqrt{x}$  and  $f[g(x)] = 3 + 2\sqrt{x} + x$ , then the value of  $f(x)$  is  
 (a)  $1 + 2x^2$  (b)  $2 + x^2$   
 (c)  $1 + x$  (d)  $2 + x$
27. If  $0 < a < 1$  and  $f(x) = \sqrt{\frac{\log_a |x-2|}{|x|}}$ , then the domain of  $f(x)$  is  
 (a)  $[1, 2)$  (b)  $(2, 3]$   
 (c)  $[1, 2) \cup (2, 3]$  (d)  $\mathbb{R} - (1, 3)$
28. The interval for which  $\sin^{-1} \sqrt{x} + \cos^{-1} \sqrt{x} = \frac{\pi}{2}$  holds is  
 (a)  $[0, \infty)$  (b)  $[0, 3]$   
 (c)  $[0, 1]$  (d)  $[0, 2]$
29. The domain of the function  $f(x) = \sqrt{x - \sqrt{1 - x^2}}$  is  
 (a)  $\left[-1, -\frac{1}{\sqrt{2}}\right] \cup \left[\frac{1}{\sqrt{2}}, 1\right]$  (b)  $[-1, 1]$   
 (c)  $\left(-\infty, -\frac{1}{\sqrt{2}}\right] \cup \left[\frac{1}{\sqrt{2}}, +\infty\right)$  (d)  $\left[\frac{1}{\sqrt{2}}, 1\right]$
30. The range of values of  $f(x) = 1 + \sin x + \sin^3 x + \sin^5 x, \dots, x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$  is  
 (a)  $(0, 1)$  (b)  $(-\infty, \infty)$   
 (c)  $(-2, 2)$  (d) none of these



31. The range of the function  $y = \sin^{-1} \left( \frac{x}{1+x^2} \right)$  is  
 (a)  $\left[-\frac{\pi}{6}, \frac{\pi}{6}\right]$  (b)  $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$   
 (c)  $\left[-\frac{\pi}{3}, \frac{\pi}{3}\right]$  (d)  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
32. If  $f(x) = \lim_{t \rightarrow \infty} \frac{(1+\sin \pi x)^t - 1}{(1+\sin \pi x)^t + 1}$ , then the range of  $f(x)$  is  
 (a)  $\{-1, 1\}$  (b)  $\{0, 1\}$   
 (c)  $[-1, 1]$  (d)  $\{-1, 0, 1\}$
33. The domain of the function  $f(x) = \sqrt{x^2 - [x]^2}$ , where  $[x]$  = the greatest integer less than or equal to  $x$ , is  
 (a)  $\mathbb{R}$  (b)  $[0, +\infty)$   
 (c)  $(-\infty, 0]$  (d) none of these
34. Which of the following functions has period  $\pi$  ?  
 (a)  $2\cos \left(\frac{2\pi x}{3}\right) + 3\sin \left(\frac{\pi x}{3}\right)$  (b)  $|\tan x| + \cos 2x$   
 (c)  $4\cos \left(2\pi x + \frac{\pi}{2}\right) + 2\sin \left(\pi x + \frac{\pi}{4}\right)$  (d) none of these
35. The period of  $f(x) = \sin \sqrt{2}x + \cos \sqrt{3}x$  is  
 (a)  $\pi$  (b)  $\frac{\pi}{\sqrt{6}}$   
 (c)  $2\pi$  (d) none of these
36. If  $f(x) = \sqrt{3|x| - x - 2}$  and  $g(x) = \sin x$ , then the domain of the definition of  $f \circ g(x)$  is  
 (a)  $\left\{2n\pi + \frac{\pi}{2}\right\}$  (b)  $\bigcup_{n \in I} \left(2n\pi + \frac{7\pi}{6}, 2n\pi + \frac{11\pi}{6}\right)$   
 (c)  $\left\{2n\pi + \frac{7\pi}{6}\right\}_{n \in I}$  (d)  $\left(2n\pi + \frac{7\pi}{6}, 2n\pi + \frac{11\pi}{6}\right) \bigcup_{n, m \in I} \left(2n\pi + \frac{\pi}{2}\right)$
37. The domain of  $f(x) = \sin^{-1} \left(\frac{1+x^2}{2x}\right) + \sqrt{1-x^2}$  is  
 (a)  $\{1\}$  (b)  $(-1, 1)$   
 (c)  $\{-1, 1\}$  (d) none of these
38. Period of the function  $f(x) = e^{[\sin 3x] - \sin 3x}$ , where  $[ ]$  is the greatest integer function, is  
 (a)  $2\pi$  (b)  $6\pi$   
 (c)  $2\pi/3$  (d) none of these
39. If  $f(x) = \sin x + \tan \frac{1}{2}x + \sin \frac{1}{2^2}x + \tan \frac{1}{2^3}x + \dots + \sin \frac{1}{2^{n-1}}x + \tan \frac{1}{2^n}x$   
 is a periodic function with period  $k\pi$ , then  $k =$   
 (a) 1 (b) 2  
 (c)  $2^n$  (d)  $1/2^n$
40. The domain of the function  $f(x) = \frac{1}{\sqrt{x^{12} - x^9 + x^4 - x + 1}}$  is  
 (a)  $(-\infty, -1)$  (b)  $(1, \infty)$   
 (c)  $(-1, 1)$  (d)  $(-\infty, \infty)$
41. The range of the function  $f(x) = \sqrt{x^2 + x + 1}$  is equal to  
 (a)  $[0, \infty)$  (b)  $\left[\frac{\sqrt{3}}{2}, \infty\right)$   
 (c)  $\left(\frac{\sqrt{3}}{2}, \infty\right)$  (d) none of these



42. Let  $f(x) = \cos^{-1} \left( \frac{x^2}{1+x^2} \right)$ . The range of  $f$  is
- (a)  $\left[0, \frac{\pi}{2}\right]$  (b)  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$   
 (c)  $\left[-\frac{\pi}{2}, 0\right]$  (d) none of these
43. The domain of the function  $f(x) = \sqrt{1 - \sqrt{1 - \sqrt{1 - x^2}}}$  is
- (a)  $(-\infty, 1)$  (b)  $(-1, \infty)$   
 (c)  $[0, 1]$  (d)  $[-1, 1]$
44. The value of  $\log_2 \log_2 \sqrt{\sqrt{\dots \sqrt{2}}}$ , there being  $n$  square root signs, is equal to
- (a)  $n$  (b) 1  
 (c)  $-n$  (d) none of these
45. If  $f(x) = \sin(\log x)$ , then the value of  $f(xy) + f\left(\frac{x}{y}\right) - 2f(x)\cos(\log y)$  is
- (a) -1 (b) 0  
 (c) 1 (d) none of these
46. The function  $f: (-\infty, -1] \rightarrow (0, e^5)$ , defined by  $f(x) = e^{x^3-3x+2}$ , is
- (a) many-one and onto (b) many-one and into  
 (c) one-one and onto (d) one-one and into
47. The period of the function  $f(x) = \sin^4 x + \cos^4 x$  is
- (a)  $\pi$  (b)  $\pi/2$   
 (c)  $2\pi$  (d) none of these
48. If for a real number  $x$ ,  $[x]$  denotes the greatest integer less than or equal to  $x$ , then for any  $n \in \mathbb{N}$
- $$\left[\frac{n+1}{2}\right] + \left[\frac{n+2}{4}\right] + \left[\frac{n+4}{8}\right] + \left[\frac{n+8}{16}\right] + \dots =$$
- (a)  $n$  (b)  $n-1$   
 (c)  $n+1$  (d)  $n+2$
49. The domain of the function  $y = \cos^{-1} \left[ \frac{1+x^4}{2x^2} \right] + \sqrt{x(x+2)}$  is
- (a)  $[-1, 1]$  (b)  $(-1, 1)$   
 (c)  $\{-1, 1\}$  (d)  $\{1\}$
50. The domain of  $f(x) = \sqrt{\sin(\cos x)} + \cos^{-1}(2+2x)$  is
- (a)  $\left[\frac{-3}{2}, \frac{-1}{2}\right]$  (b)  $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$   
 (c)  $\left[\frac{-\pi}{2}, \frac{-3}{2}\right] \cup \left[\frac{-1}{2}, \frac{\pi}{2}\right]$  (d) none of these
51. The domain of the function
- $$f(x) = \log_{10} \frac{x-5}{x^2-10x} - \sqrt[3]{x+5}$$
- (a)  $(4, 5)$  (b)  $(6, \infty)$   
 (c)  $(4, 5) \cup (6, \infty)$  (d)  $(4, 5] \cup (6, \infty)$
52. Which of the following functions is non-periodic?
- (a)  $\frac{2^x}{2^{[x]}}$  (b)  $\sin^{-1}[(x)]$   
 (c)  $\sin^{-1}(\sqrt{\cos x})$  (d)  $\sin^{-1}[\cos(x^2)]$



53. The range of the function

$$f(x) = \sin^4 x(1 + \sin^2 x) + \cos^4 x(1 + \cos^2 x) \text{ is}$$

(a)  $[0, 2]$

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

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

(d)  $\mathbb{R}$

54. The range of the function  $y = \sin\left(x + \frac{\pi}{6}\right) + \cos\left(x - \frac{\pi}{6}\right)$  is

(a)  $[-\sqrt{2}, \sqrt{2}]$

(b)  $[-\sqrt{2}(\sqrt{3} + 1), \sqrt{2}(\sqrt{3} + 1)]$

(c)  $\left[-\frac{\sqrt{3}+1}{\sqrt{2}}, \frac{\sqrt{3}+1}{\sqrt{2}}\right]$

(d) none of these

55. The range of the function  $f(x) = \frac{x-1}{x+3}$  is

(a)  $\mathbb{R}$

(b)  $\mathbb{R} - \{-1\}$

(c)  $\mathbb{R} - \{1\}$

(d)  $\mathbb{R} - \{-3\}$

## ANSWER KEY

|        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|
| 1-(c)  | 2-(a)  | 3-(d)  | 4-(b)  | 5-(d)  | 6-(c)  | 7-(c)  |
| 8-(a)  | 9-(a)  | 10-(d) | 11-(b) | 12-(a) | 13-(a) | 14-(c) |
| 15-(c) | 16-(b) | 17-(a) | 18-(c) | 19-(d) | 20-(d) | 21-(b) |
| 22-(c) | 23-(d) | 24-(b) | 25-(b) | 26-(b) | 27-(c) | 28-(c) |
| 29-(d) | 30-(b) | 31-(a) | 32-(d) | 33-(d) | 34-(b) | 35-(d) |
| 36-(d) | 37-(c) | 38-(c) | 39-(c) | 40-(d) | 41-(b) | 42-(d) |
| 43-(d) | 44-(c) | 45-(b) | 46-(d) | 47-(b) | 48-(a) | 49-(d) |
| 50-(a) | 51-(c) | 52-(d) | 53-(c) | 54-(c) | 55-(c) |        |

