MATHS

BOOKS - OBJECTIVE RD SHARMA MATHS VOL I (HINGLISH)

REAL FUNCTIONS

Illustration

1. If $f(x) = x + \frac{1}{x}$, such that $f^3(x) = f(x^3) + \lambda f\left(\frac{1}{x}\right)$, then $\lambda =$

A. 1

B. 3

C. -3

D. -1

Answer: B

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2. If $y = f(x) = \frac{(x+2)}{(x-1)}, then\ x = f(y)$ (b) $f(1) = 3\ y$ increases with $x f$ or $x < 1\ f$ is a rational function of x

A. x=f(y)

B. f(1)=3

C. y increases with x for $x < 1$

D. f is a rational function of x

Answer: A

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3. If $f(x) = \cos(\log x)$, then $f(x)f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right] =$

A. 1

B. 0

C. -1

D. none of these

Answer: B

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4. Let $a, b, c \in R$. If f(x)=$ax^2 + bx + c$ is such that a+b+c=3 $f(x + y) = f(x) + f(y) + xy \forall x, y \in R$ then $\sum_{n=1}^{10} f(n)$ is equal to

A. 190

B. 255

C. 330

D. 165

Answer: C

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5. if for nonzero x, $af(x)+bf\left(\frac{1}{x}\right)=\frac{1}{x}-5$, where $a \neq b$ then f(2) =

A. $\frac{3(2b+3a)}{2(a^2-b^2)}$

B. $\frac{3(2b-3a)}{2(a^2-b^2)}$

C. $\frac{3(3a-2b)}{2(a^2-b^2)}$

D. $\frac{6}{a+b}$

Answer: B

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6. If $af(x+1)+bf\left(\frac{1}{x+1}\right)=x, x \neq -1, a \neq b$, then $f(2)$ is equal to

A. a+b

B. a^2-b^2

C. $\frac{1}{a+b}$

D. none of these

Answer: D

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7. If $f(x)$ is defined on $[0, 1]$ by the rule $f(x) = \{x,$ if x is rational , $1 - x,$ if x is rational ' then for all $x \in [0, 1]$,$f(f(x))$ is

A. x

B. $-x$

C. $1 + x$

D. 1-x

Answer: A

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8. If $f(x)$ is a polynomial satisfying $f(x)f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$ and $f(3) = 28$ then $f(4) =$

A. 63

B. 65

C. 66

D. 27

Answer: B

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9. If $g(x)$ is a polynomial satisfying $g(x)g(y) = g(x) + g(y) + g(xy) - 2$ for all real x and y and $g(2) = 5$ then $\lim_{x \to 3} g(x)$ is

A. 6

B. 25

C. 24

D. 26

Answer: D

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10. If $3f(x) - f\left(\frac{1}{x}\right) = \log_e x^4$ for $x > 0$,then $f(e^x) =$

A. x

B. $\log_e x$

C. e^x

D. none of these

Answer: A

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11. If $f(x)+2f\left(\frac{1}{x}\right)=3x, x\neq 0$, and $S=\{x\in R: f(x)=f(-x)\}$, then S:

A. is an empty set

B. contains exactly one element

C. Contains exactly two elements .

D. contains more than two elements

Answer: C

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12. If $f(x)=\frac{x}{x-1}$,then$(\underset{19\text{times}}{fofofo...of})$ (x) is equal to

A. $\frac{x}{x-1}$

B. $\left(\frac{x}{x-1}\right)^{19}$

C. $\frac{19x}{x-1}$

D. x

Answer: A

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13. For $x \in R, x \neq 0, 1,$ let $f_0(x) = \frac{1}{1-x}$ and $f_{n+1}(x) = f_0(f_n(x)), n = 0, 1, 2\ldots.$ Then the value of $f_{100}(3) + f_1\left(\frac{2}{3}\right) + f_2\left(\frac{3}{2}\right)$ is equal to

A. $\frac{4}{3}$

B. $\frac{1}{3}$

C. $\frac{5}{3}$

D. $\frac{8}{3}$

Answer: C

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14. Let f be a real valued function satisfying $f(x+y)=f(x)+f(y)$ for all $x, y \in R$ and $f(1)=2$. Then $\sum_{k=1}^{n} f(k)=$

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

B. $n(n+1))$

C. $(n+1)$

D. n

Answer: B

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15. Let f be a real valued function satisfying

$f(x+y)=f(x)f(y)$ for all $x, y \in R$ such that $f(1)=2$.

Then , $\sum_{k=1}^{n} f(k)=$

A. $2^{n+1}-2$

B. $2^{n+1}-1$

C. $2^n - 1)$

D. $2^n - 2$

Answer: A

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16. Let f be a real valued function satisfying $f(x+y) = f(x)f(y)$ for all $x, y \in R$ such that f(1)=2 .

If $\sum_{k=1}^{n} f(a+k) = 16(2^n - 1)$, then a=

A. 3

B. 4

C. 2

D. none of these

Answer: A

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17. Let $f: R \to R$ be given by $f\left(x+\frac{5}{6}\right)+f(x)=f\left(x+\frac{1}{2}\right)+f\left(x+\frac{1}{3}\right)$ for all $x \in R$. Then ,

A. f(x) is periodic

B. f(x) is even

C. $f(x+2)-f(x+1)=f(x+1)-f(x)$

D. none of these

Answer: C

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18. A real valued function f(x) satisfies the functional equation $f(x-y)=f(x)f(y)-f(a-x)f(a+y)$, where a is a given constant and f(0), f(2a-x) =

A. f(-x)

B. f(a)+f(a-x)

C. f(x)

D. $-f(x)$

Answer: D

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19. The domain [प्रांत] of the function $f(x)=\sqrt{x-\sqrt{1-x^2}}$ is

A. $\left[1,\ -1/\sqrt{2}\right)\ ]\cup\left[1/\sqrt{2},1\right]$

B. [-1,1]

C. $(-\infty,\ -1/2)\cup\left[1/\sqrt{2},\infty\right)$

D. $\left[1/\sqrt{2},1\right]$

Answer: D

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20. The domain [प्रान्त] 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]

Answer: D

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21. The domain [प्रान्त] of the function

$f(x) = \sqrt{x^2 - 5x + 6} + \sqrt{2x + 8 - x^2}$, is

A. [2,3]

B. [-2,4]

C. [-2,2] $\cup$ [3,4]

D. [-2,1] $\cup$ [2,4]

Answer: C

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22. The domain of definiton 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. R

Answer: D

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23. The domain [प्रान्त] of $f(x) = \frac{1}{\sqrt{[x]^2 - [x] - 6}}$, is [.]=GIF

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

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

C. $(-\infty, -2) \cup (4, \infty)$

D. none of these

Answer: A

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24. Find 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

Answer: C

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

A. $[0, 1/2]$

B. $[-1/2, 1/2]$

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

D. $[-1/2, 0) \cup (0, 1/2]$

Answer: B

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

A. $[1, \infty)$

B. $[2, \infty)$

C. $[3/2, \infty)$

D. none of these

Answer: A

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

A. (0,1)

B. [0,1]

C. $(1, \infty)$

D. $[1, \infty)$

Answer: C

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28. Range of the function $f(x) = \frac{x^2-3x+2}{x^2+x-6}$ is

A. $R - \{1/5, 1\}$

B. $R - \left\{\frac{1}{5}\right\}$

C. $R - \{1\}$

D. R

Answer: A

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29. Range[परिसर] of the function $f(x) = \log_e \sqrt{4 - x^2}$ is

A. $(0, \infty)$

B. $(-\infty, \infty)$

C. $(-\infty, \log_e 2]$

D. $(\log_e 2, \infty)$

Answer: C

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30. If $f(x) = \cos\left[\pi^2\right]x + \cos\left[-\pi^2\right]x$, where $[x] =$ GIF, then

A. $f\left(\frac{\pi}{2}\right) = -1$

B. $f(\pi) = 1$

C. $f(-\pi) = -1$

D. $f\left(\frac{\pi}{4}\right) = 2$

Answer: A

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31. Let $f(x) = \left[x^2\right] + [x+2] - 8$, where [x] denotes the greater integer than or equal to x , then

A. $f(x) \neq 0$ for all $x \in R$

B. $f(x) = 0$ only for two real values of x

C. $f(x) = 0$ for infinity many values of x

D. none of these

Answer: C

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32. For a real number x, $[x]$ denotes greatest integer function, then find value of $\left[\frac{1}{2}\right]+\left[\frac{1}{2}+\frac{1}{100}\right]+\left[\frac{1}{2}+\frac{2}{100}\right]+\ldots.+\left[\frac{1}{2}+\frac{99}{100}\right]$

A. 49

B. 50

C. 48

D. 51

Answer: B

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33. Prove that for $n = 1, 2, 3...$

$\left[\frac{n+1}{2}\right] + \left[\frac{n+2}{4}\right] + \left[\frac{n+4}{8}\right] + \left[\frac{n+8}{16}\right] + ... = n$ where $[x]$ represents Greatest Integer Function

A. n

B. n-1

C. n+1

D. n+2

Answer: A

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34. If f(x) and [x] denote respectively the fractional and integeral parts of a real number x, then the number of solution of the euation 4{x}=x+[x] , is

A. 1

B. 2

C. 3

D. infinitely many

Answer: B

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35. The number of integral solutions of the equation $\{x+1\}+2x=4[x+1]-6$, is

A. 0

B. 1

C. 2

D. 3

Answer: B

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36. Let

$g(x) = 1 = x - [x]$ and $f(x) = \{-1, x < 0, 0, x = 0$ and $1, x > 0,$

then for all x, $f(g(x))$ is equal to (i) x (ii) 1 (iii) f(x) (iv) g(x)

A. x

B. 1

C. f(x)

D. g(x)

Answer: B

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37. The domain of function $f(x) = \frac{\cos^{-1} x}{[x]}$; $[x] = GIF$ is:

A. $[-1, 1]$

B. $[-1, 1] - \{0\}$

C. $[-1, 0) \cup \{1\}$

D. $[-1, 0)$

Answer: C

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38. The domain of the function

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

A. $(0, \infty)$

B. $(-\infty, 0)$

C. $R - \{0\}$

D. none of these

Answer: B

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39. Find domain of the function $f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$

A. $[-2, 1)$

B. $[-2, \infty)$

C. $(-\infty, 1)$

D. $[-2, 0) \cup (0, 1)$

Answer: D

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40. Find the domain of the function $f(x) = \sqrt{1-2x} + 3\sin^{-1}\left(\frac{3x-1}{2}\right)$

A. $[-1/3, 1]$

B. $(-\infty, 1/2]$

C. $[-1/3, 1/2]$

D. $[-1/3, 1/2)$

Answer: C

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41. The domain of the function $\psi(x) = \frac{1}{x} + 2^{\sin^{-1}x} + \frac{1}{\sqrt{x-2}}$ is

A. [-1,1]

B. R-{0}

C. $[-1, 0) \cup (0, 1]$

D. none of these

Answer: D

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42. The domain of definition of the function

$f(x) = \sin^{-1}\left\{\log_2\left(\frac{x^2}{2}\right)\right\}$, is

A. $[-2, -1]$

B. [1,2[

C. $[-2, -1] \cup [1, 2]$

D. none of these

Answer: C

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43. The domain of the function

$f(x) = \sqrt{\log_2 \sin x}$, is

A. $\left\{(2n+1)\frac{\pi}{2} : n \in Z\right\}$

B. $\frac{(4n+1)\pi}{2} : n \in Z\Big\}$

C. $\left\{(3n-1)\frac{\pi}{2} : n \in Z\right\}$

D. $\left\{\frac{n\pi}{2} : n \in Z\right\}$

Answer: B

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44. Find the domain of function $f(x) = (\log)_4\left[(\log)_5\left\{(\log)_3\left(18x - x^2 - 77\right\}\right]\right.$

A. (8,10)

B. [8,10]

C. $(-\infty, 8]$

D. $[10, \infty)$

Answer: A

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45. The function $f(x) = x - [x]$ is a periodic with period.

A. 1

B. 2

C. 3

D. none of these

Answer: A

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46. Let $f(x)$ be periodic and k be a positive real number such that $f(x+k) + f(x) = 0 f \text{ or } all x \in R$. Prove that $f(x)$ is periodic with period $2k$.

A. k

B. 2k

C. $\frac{k}{2}$

D. none of these

Answer: B

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47. If f is a function of real variable x satisfying $f(x+4)-f(x+2)+f(x)=0$, then f is periodic function with period:

A. 6

B. 8

C. 10

D. 12

Answer: D

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48. The function f(x) satisfies the equation $f(x+1)+f(x-1)=\sqrt{3}f(x)$. then the period of f(x) is

A. 2

B. 6

C. 12

D. 4

Answer: C

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49. Let f(x) be a real valued periodic function with domain R such that $f(x+p)=1+\left[2-3f(x)+3(f(x))^2-(f(x))^3\right]^{1/3}$ hold good for all $x \in R$ and some positive constant p, then the periodic of f(x) is

A. p

B. 3p

C. 2p

D. p^2

Answer: C

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50. The period of the function

$f(x) = |\sin x| - |\cos x|$, is

A. $\pi / 2$

B. π

C. 2π

D. none of these

Answer: B

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51. The period of the function

$f(x) = ||\sin x| - |\cos x||$, is

A. $\frac{\pi}{2}$

B. π

C. 2π

D. none of these

Answer: A

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52. If $f(x) = \sin x + \cos ax$ is a periodic function, show that a is a rational number

A. $a \in Z$

B. $a \in N$

C. $a \in Q$

D. $a \in R$

Answer: C

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53. The period of $\cos x^2$ is

A. π

B. $\frac{\pi}{2}$

C. 2π

D. None

Answer: D

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54. Let f be a real valued periodic function defined for all real umbers x such that for some fixed $a > 0$, $f(x + a) = \frac{1}{2} + \sqrt{f(x) - \{f(x)\}^2}$ for all x .

Then , the period of f(x) is

A. a

B. 2a

C. 3a

D. 4a

Answer: B

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55. Let f(x, y) be a periodic function satisfying $f(x, y) = f(2x + 2y, 2y - 2x)$ for all x, y; Define $g(x) = f(2^x, 0)$. Show that g(x) is a periodic function with period 12.

A. 2

B. 4

C. 6

D. 12

Answer: D

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56. If $f: R\overrightarrow{R}$ is a function satisfying the property $f(2x+3)+f(2x+7)=2\forall x\in R,$ then find the fundamental period of $f(x)$.

A. 2

B. 4

C. 8

D. 12

Answer: C

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57. If f is a periodic function and g is a non-periodic function , then

A. fog is always periodic

B. gof is never periodic

C. gof is always periodic

D. none of these

Answer: C

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58. Let $f: R \to R$, be a periodic function such that $\{f(x): x \in N\}$ is an infinite set then, the period of f(x) cannot be

A. a rational

B. an irrational

C. e

D. π

Answer: A

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59. The period of $\sin^2 x$, is

A. 2π

B. π

C. $\frac{\pi}{2}$

D. 4π

Answer: B

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60. The period of $|\cos x|$, is

A. $\frac{\pi}{2}$

B. 2π

C. π

D. none of these

Answer: C

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61. the period of the $f(x) = \sin^4 x + \cos^4 x$ is

A. π

B. 2π

C. 4π

D. $\frac{\pi}{2}$

Answer: D

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62. The period of $f(x) = \sin\left(\frac{\sin(x)}{5}\right)$, is

A. 2π

B. $\frac{2\pi}{5}$

C. 10π

D. π

Answer: C

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63. The periodic function $f(x) = a\sin\lambda x + b\cos\lambda x$ is

A. $\frac{2\pi}{\lambda}$

B. $\frac{\pi}{\lambda}$

C. $\frac{2\pi}{|\lambda|}$

D. $\frac{\pi}{|\lambda|}$

Answer: C

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64. The period of $f(x) = \sin\frac{2\pi x}{3} + \cos\frac{\pi x}{2}$, is

A. 3

B. 4

C. 6

D. 12

Answer: D

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65. Find the period of $f(x) = \sin x + \frac{\tan x}{2} + \frac{\sin x}{2^2} + tan\frac{x}{2^3} + + \frac{\sin x}{2^{n-1}} + \frac{\tan x}{2^n}$

A. 2π

B. $2^{n-1}\pi$

C. $2^n\pi$

D. $n\pi$

Answer: C

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66. The period of f(x)=5 sin 3x-7 sin 8x , is

A. π

B. 2π

C. 3π

D. 8π

Answer: B

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67. The period of $f(x) = \tan 3x + \cos \frac{5x}{2}$,is

A. 2π

B. 6π

C. 4π

D. 10π

Answer: C

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68. The period of $f(x) = \cos x + \{x\}$, is

A. 2π

B. 1

C. π

D. none- existent

Answer: D

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69. Identify the correct statement the fundamental period of $f(x) = \cos(\sin x) + \cos(\cos x)$ is π

A. π

B. 2π

C. $\pi/2$

D. 4π

Answer: C

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70. The period of the function $f(x) = |\sin x| + |\cos x|$ is

A. π

B. $\frac{\pi}{2}$

C. 2π

D. none of these

Answer: B

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71. The period of

$f(x) = \frac{1}{2}\left\{\frac{|\sin x|}{\cos x} + \frac{|\cos|}{\sin x}\right\}$, is

A. π

B. $\frac{\pi}{2}$

C. 2π

D. none of these

Answer: C

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72. The function $f(x) = \sin^{-1}(\sin x)$, is

A. periodic with period 2π

B. periodic with period π

C. periodic with period $\frac{\pi}{2}$

D. non-periodic

Answer: A

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73. Let $[x]$ denotes the greatest integer less than or equal to x . If the function $f(x) = \tan\left(\sqrt{[n]}x\right)$ has period $\frac{\pi}{3}$. then find the value of n.

A. $n \in (1, 3)$

B. $n \in (9, 10)$

C. $n \in [9, 10)$

D. $n \in [9, \infty)$

Answer: C

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74. Let $f(x) = \sin\sqrt{[a]}x$ (where [ ] denotes the greatest integer function). If f is periodic with fundamental period π, then a belongs to

A. $\lambda \in [4, 5)$

B. $\lambda \in [4, 5]$

C. $\lambda = 4, 5$

D. none of these

Answer: A

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75. Which of the following functions is non-periodic? (1) $\frac{2^x}{2^x} =$ (2) $\sin^{-1}(\{x\})$ (3) $\sin^{-1}\left(\sqrt{\cos x}\right)$ (4) $\sin^{-1}\left(\cos x^2\right)$

A. f(x) = tan (3x+5)

B. g(x)={x}, the fractional part of x

C. $f(x) = 1 - \frac{\cos^2 x}{1+\tan x} - \frac{\sin^2}{1+\cot x}$

D. $\phi(x) = x + \cos x$

Answer: D

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76. The period of the function

$f(x) = \cos 2\pi\{2x\} + \sin 2\pi\{2x\},$

is (where {x} denotes the functional part of x)

A. 1

B. $\frac{\pi}{2}$

C. $\frac{1}{2}$

D. π

Answer: C

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77. The period of

$f(x) = \frac{1}{2}\left\{\frac{|\sin x|}{\cos x} + \frac{|\cos|}{\sin x}\right\},$ is

A. 2π

B. π

C. $\frac{\pi}{2}$

D. $\frac{\pi}{4}$

Answer: A

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78. The function $f(x) = 2\cos 5x + 3\sin\sqrt{5x}$, is

A. a periodic function with period 2π

B. a periodic function with period $\frac{2\pi}{5}$

C. a periodic function with period $\frac{2\pi}{\sqrt{5}}$

D. not a periodic function

Answer: D

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79. If $f(x) = \lambda|\sin x| + \lambda^2|\cos x| + g(\lambda)$ has a period = $\frac{\pi}{2}$ then find the value of λ

A. 1

B. 2

C. 3

D. none of these

Answer: A

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80. The period of the fuction

$f(x) = \sin\left(\frac{\pi x}{n!}\right) + \cos\left(\frac{\pi x}{(n+1)!}\right)$, is

A. $2 \times (n+1)!$

B. $2(n!)$

C. $n+1$

D. none of these

Answer: A

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81. The function $f(x) = \cos\frac{x}{2} + \{x\}$, where {x}= the fractional part of x , is a

A. periodic function with period 4π

B. periodic function with period 1

C. periodic function with indeterminate period

D. none of these

Answer: D

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82. The function $f(x) = \min\{x - [x], -x - |-x|\}$ is a

A. periodic function with period 1

B. periodic function with period 1/2

C. non-periodic function

D. periodic function with period 2

Answer: A

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83. If [x] denotes the greatest integer less than or equal to x and $n \in N$, then $f(X) = nx + n - [nx + n] + \tan\frac{\pi x}{2}$, is

A. a periodic function with period 1

B. a periodic function with period 4 .

C. not periodic

D. a periodic function with period 2.

Answer: D

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84. Let $f(x) = \frac{\sin 2nx}{1 + \cos^2 nx}, n \in N$ has $\frac{\pi}{6}$ as its fundamental period , then n=

A. 2

B. 4

C. 6

D. none of these

Answer: C

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85. Which of the following functions is an odd functions ?

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

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

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

D. f(x)=k (constant)

Answer: A

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86. Which of the following functions is an odd functions ?

A. $f(x)$= const

B. f(x)=sinx+ cosx

C. $f(x) = \sin\left\{\log_{10}\left(x+\sqrt{x^2+1}\right)\right\}$

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

Answer: C

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87. If f is an even function defined on the interval $(-5, 5)$ then find the total number of real values of x satisfying the equations $f(x) = f\left(\frac{x+1}{x+2}\right)$ are

A. 1

B. 2

C. 4

D. none of these

Answer: C

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88. The function f(x) given by

$$f(x) = \begin{cases} x^4 \tan\frac{\pi x}{2} & |x| < 1 \\ x|x| & |x| \geq 1 \end{cases} is$$

A. an odd function

B. an even function

C. a periodic function with period $\frac{2\pi}{\sqrt{5}}$

D. none of these

Answer: A

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89. If a real valued function $f(x)$ satisfies the equation $f(x+y)=f(x)+f(y)$ for all $x, y \in R$ then $f(x)$ is

A. a periodic function

B. an even function

C. an odd function

D. none of these

Answer: C

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90. A function whose graph is symmetrical in opposite quadrants is

A. $f(x) = e^x + e^{-x}$

B. $f(x) = \log_e x$

C. $f(x + y) = f(x) + f(y)$

D. $f(x) = \cos(x) + \sin x$

Answer: C

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91. A function whose graph is symmetrical about y-axis is

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

B. $f(x) = \log_2\left(x + \sqrt{x^2 + 1}\right)$

C. $f(x + y) = f(x) + f(y)$

D. $f(x) = \sin x + \cos x$

Answer: A

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92. A function f(x) given by

$$f(x) = \begin{cases} x^2 \sin \frac{\pi x}{2} & |x| < 1 \\ x|x| & |x| \geq 1 \end{cases} is$$

A. an even function

B. an odd function

C. a periodic function

D. none of these

Answer: B

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93. If f(x) is a real valued odd function , then which one of the following is incorrect ?

A. $\frac{f(x)-f-(-x)}{2}$ is an odd function.

B. $\frac{f(x)+f(-x)}{2}$ is an even function.

C. $[|f(x)|+2]$ is an even function, $[\cdot]$ denotes the greatest integer function.

D. $\frac{f(x)-f(-x)}{2}$ is neither even nor odd.

Answer: D

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94. If $f:[-\pi/2, \pi/2] \cup R$ given by $f(x)=\cos x+\sin\left[\frac{x+1}{\lambda}\right]$ is an even function. Then the set of values of $\lambda(\lambda>0)$ is Here, $[\cdot]$ denotes the greatest integer function.

A. $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$-{0}

B. $\left(\frac{\pi+2}{2}, \infty\right)$

C. $\left(0, \frac{\pi+2}{2}\right) \cup \left(\frac{\pi+2}{2}, \infty\right)$

D. $\left(\frac{-\pi}{2}, \frac{\pi+2}{2}\right) - \{0\}$

Answer: B

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95. If $f(x)$ is an odd periodic function with period 2, then f(4) equals to-

A. -4

B. 4

C. 2

D. 0

Answer: D

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96. Let be a real function satisfying $f(x)+f(y)=f\left(\frac{x+y}{1-xy}\right)$ for all $x, y \in R$ and $xy \neq 1$.

Then f(x) is

A. a periodic function with period $\pi/2$

B. an odd function

C. an even function

D. none of these

Answer: B

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97. Let $f: R \to R$ such that $f(x+y)+f(x-y)=2f(x)f(y)$ for all $x, y \in R$. Then,

A. f(x) an even function , if $f(0) \neq 0$

B. f(x) is an odd function, if $f(0) \neq 0$

C. f(x) an even function , if $f(0) = 0$

D. f(x) is an odd function , if $f(0) = 0$

Answer: A::D

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98. Let $f: \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \to \mathbb{R}$ be given by $f(x) = (\log(\sec x + \tan x))^3$

Then which of the following is wrong?

A. f(x) is an odd function

B. f(x) is a one-one function

C. f(x) is an onto function

D. f(x) is an even function

Answer: A::B::C

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99. $f(x) = \begin{cases} 4 & x < -1 \\ -4x & -1 \leq x \leq 0 \end{cases}$ If $f(x)$ is an even function in R then the definition of $f(x)$ in $(0, \infty)$ is: (A) $f(x) = \begin{cases} 4x & 0 < x \leq 1 \\ 4 & x > 1 \end{cases}$ (B) $f(x) = \begin{cases} 4x & 0 < x \leq 1 \\ -4 & x > 1 \end{cases}$ (C) $f(x) = \begin{cases} 4 & 0 < x \leq 1 \\ 4x & x > 1 \end{cases}$ (D) $f(x) = \begin{cases} 4 & x < -1 \\ -4x & -1 \leq x \leq 0 \end{cases}$

A. $f(x) = \begin{matrix} 4x & 0 < x \leq 1 \\ 4 & x > 1 \end{matrix}$

B. $f(x) = \begin{cases} 4x & 0 < x \leq 1 \\ -4 & x > 1 \end{cases}$

C. $f(x) = \begin{cases} 4 & 0 < x \leq 1 \\ 4x & x > 1 \end{cases}$

D. none of these

Answer: A

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100. Let the function

$f(x) = 4\sin x + 3\cos x + \log\left(|x| + \sqrt{1 + x^2}\right)$ be defined on the interval [0,1]. The odd extension of f(x) to the inteval $[-1, 1]$ is

A. $4\sin x + 3\cos x + \log\left(|x| + \sqrt{1+x^2}\right),\ -1 \le x < 0$

B. $4\sin x - 3\cos x - \log\left(|x| + \sqrt{1+x^2}\right),\ -1 \le x < 0$

C. $4\sin x + 3\cos x + \log\left(|x| + \sqrt{1+x^2}\right),\ -1 \le x < 0$

D. none of these

Answer: B

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Section I - Solved Mcqs

1. If $f(x) = \dfrac{x-1}{x+1}$, then $f(\alpha, x) =$

A. $\dfrac{f(x)+\alpha}{1+\alpha f(x)}$

B. $\dfrac{(\alpha-1)f(x)+\alpha+1}{(\alpha+1)f(x)+(\alpha-1)}$

C. $\dfrac{(\alpha+1)f(x)+\alpha-1}{(\alpha-1)f(x)+(\alpha+1)}$

D. none of these

Answer: c

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2. If $f(x) = 27x^3 - \frac{1}{x^3}$ and α, β are roots of $3x - \frac{1}{x} = 2$ then

A. $f(\alpha) = f(\beta)$

B. $f(\alpha) = 10$

C. $f(\beta) = -10$

D. none of these

Answer: A

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3. Let $f: R \to R$ be a function given by $f(x+y) = f(x) + f(y)$ for all x,y $\in$ R such that $f(1) = a$ Then, $f(x) =$

A. a^x

B. ax

C. a^x

D. $a + x$

Answer: B

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4. Let $f: R \to R$ be a function given by $f(x + y) = f(x) + f(y)$ for all x,y $\in$ R such that $f(1) = a$ Then, $f(x) =$

A. a^x

B. ax

C. a^x

D. none of these

Answer: A

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5. Le the be a real valued functions satisfying $f(x+1)+f(x-1)=2f(x)$ for all $x, y \in R$ and $f(0)=0$, then for any $n \in N$, f(n) =

A. n f(1)

B. $[f(1)]^n$

C. 0

D. none of these

Answer: A

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6. If $f(x)$ is a real valued functions satisfying $f(x+y)=f(x)+f(y)-yx-1$ for all $x, y \in R$ such that $f(1)=1$ then the number of solutions of $f(n)=n, n \in N$, is

A. 1

B. 2

C. 3

D. 4

Answer: A

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

A. $3^m - 1$

B. 3^m

C. 3^{m-1}

D. none of these

Answer: C

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8. If $f(x) = ax^2 + bx + c$ satisfies the identity $f(x+1) - f(x) = 8x + 3$ for all $x \in R$ Then (a,b)=

A. $(2, 1)$

B. $(4, -1)$

C. $(-1, 4)$

D. $(-1, 1)$

Answer: B

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9. If $f(x+y, x-y) = xy$ then $\frac{f(x,y) + f(y,x)}{2} =$

A. x

B. y

C. 0

D. none of these

Answer: C

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10. A polynomial function f(x) satisfies the condition $f(x)f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$ for all $x \in R, x \neq 0$. If f(3)=-26, then f(4)=

A. -35

B. -63

C. 65

D. none of these

Answer: B

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11. If $f: R \to R, g, R \to R$ be two funcitons, and $h(x) = 2\min\{f(x) - g(x), 0\}$ then $h(x) =$

A. $f(x) + g(x) - |g(x) - f(x)|$

B. $f(x) + g(x) + |g(x) - f(x)|$

C. $f(x) - g(x) + |g(x) + |g(x) - f(x)|$

D. $f(x) - g(x) - |g(x) - f(x)|$

Answer: D

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12. If $f(x) = \cos[\pi]x + \cos[\pi x]$, where $[y]$ is the greatest integer function of y then $f\left(\frac{\pi}{2}\right)$ is equal to

A. $\cos 3$

B. 0

C. $\cos 4$

D. none of these

Answer: C

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13. If $f(x) = \cos\left[\frac{\pi^2}{2}\right]x + \sin\left[\frac{-\pi^2}{2}\right]x$, $[x]$ denoting the greatest integer function,then

A. $f(0) = 0$

B. $f\left(\frac{\pi}{3}\right) = \frac{\sqrt{(3)-1}}{2}$

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

D. $f(\pi) = 0$

Answer: B

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14. If one the roots fo the equation $x^2 + xf(a) + a = 0$ is the cube of the othere for all $x \in R$, then f(x)=

A. $x^{1/4} + x^{3/4}$

B. $-\left(x^{1/4} + x^{3/4}\right)$

C. $x + x^3$

D. none of these

Answer: B

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15. If the graph of a function f(x is symmetrical about the line x = a, then

A. $f(a + x) = f(a - x)$

B. $f(a + x) = f(x - a)$

C. $f(x) = f(-x)$

D. none of these

Answer: A

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16. If a real function f(x) satisfies the relation $f(x) = f(2a - x)$ for all $x \in R$. Then, its graph is symmetrical about the line.

A. $x = 0$

B. $x = 2a$

C. $x = a$

D. $x = -a$

Answer: B

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17. The largest interval lying in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ for which the function $\left[f(x) = 4^{-x} \hat{} 2 + \cos^{-1}\left(\frac{x}{2} - 1\right) + \log(\cos x)\right]$ is defined, is (1) $[0, \pi]$

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

A. $[-\pi/4, 2)$

B. $[0, \pi/2)$

C. $[0, \pi]$

D. $(-\pi/2, \pi/2)$

Answer: B

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18. The domain of $f(x) = \log_2\left(2x^3 - x^2 - 4x + 2\right)$, is

A. $\left(-\sqrt{2}, 1/2\right) \cup \left(\sqrt{2}, \infty\right)$

B. $(-1, 1/2) \cup \left(\sqrt{2}, \infty\right)$

C. $\left(-\sqrt{2}, -1\right) \cup (1, \infty)$

D. $\left(-\infty, -\sqrt{2}\right) \cup \left(\sqrt{2}, \infty\right)$

Answer: A

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19. If $f(x) = 1 - x, x \in [-3, 3]$, then the domain of $fof(x)$ is

A. $[-3, 3]$

B. $[-2, 3]$

C. $(-2, 3)$

D. $[-2, 3)$

Answer: B

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20. If $f(x) = \sqrt{2 - x}$ and $g(x) = \sqrt{1 - 2x}$, then the domain of fog (x) is

A. $(-\infty, 1/2)$

B. $[1/2, \infty)$

C. $(-\infty, -3/2]$

D. none of these

Answer: C

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21. Let $fog(x) = \log_e x$ and $g(x) = \frac{x^4 - 2x^3 + 3x^2 - 2x + 2}{2x^2 - 2x + 1}$

Then , the domain of fog (x) is

A. R

B. $[0, \infty)$

C. $(0, \infty)$

D. $[1, \infty)$

Answer: A

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22. Let f(x) be a function whose domain is $[-5, 7]$ and $g(x) = |2x + 5|$.

Then, the domain of fog (x) is .

A. $[-5, 1]$

B. $[-4, 0]$

C. $[-6, 1]$

D. none of these

Answer: C

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23. 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. $(-3, \infty) - \{-1, -2\}$

Answer: D

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24. The domain of definition of $f(x) = \sin^{-1}\{\log_2(x^2 + 3x + 4)\}$, is

A. $[-4, -1/4]$

B. $[-3, -1/3]$

C. $[-2, -1]$

D. none of these

Answer: C

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25. The domain of definition of $f(x) = \sin^{-1}\left[2 - 4x^2\right]$ is ([.] denotes the greatest integer function).

A. $\left[\sqrt{3}/2, \sqrt{3}/2\right]$

B. $\left[-\sqrt{3}/2, 0\right]$

C. $\left[-\sqrt{3}/2, 0\right) \cup \left(0, \sqrt{3}/2\right]$

D. $\left[-\sqrt{3}/2, \infty\right)$

Answer: C

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26. The domain of the function $f(x) = \sqrt{x^2 - [x]^2}$, where $[x]$ is the greatest integer less than or equal to x, is R (b) $[0, +\infty]$ $(-\infty, 0)$ (d) none of these

A. R

B. $[0, \infty)$

C. $(-\infty, 0]$

D. none of these

Answer: D

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27. The domain of definition of $f(x) = \cos^{-1}(x + [x])$ is

A. $[0, 1)$

B. $R - Z$

C. $(0, \infty)$

D. none of these

Answer: A

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28. The domain of definition of the functions $f(x-[x])$, is

A. R

B. $R-Z$

C. $(0, \infty)$

D. none of these

Answer: B

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29. If $f(x)=[x]$ and $g(x)=\{x\}=$ fraction part of x, then for any two real numbers x and y.

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

B. $g(x+y)=g(x)+g(y)$

C. $f(x+y)=f(x)+f(y+g(x))$

D. none of these

Answer: C

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30. The domain of definition of $f(x) = \log_2(\log_3(\log_4 x))$, is

A. $[4, \infty)$

B. $(4, \infty)$

C. $(-\infty, 4)$

D. none of these

Answer: B

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31. The domain of the function $f(x) = \log_2\left[\log_3\left(\log_4\left(x^2 - 3x + 6\right)\right\}\right] is$

.

A. $(1, 2)$

B. $[1, 2]$

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

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

Answer: C

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

A. $(0, 1)$

B. $[0, 1]$

C. $(0, 1]$

D. $(0, 2)$

Answer: C

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33. The domain of definition of the function $f(x) = \sqrt{\log_{x^2-1} x}$ is

A. $(\sqrt{2}, \infty)$

B. $(0, \infty)$

C. $(1, \infty)$

D. none of these

Answer: A

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34. Find the domain of the following functions :

$$f(x) = \sqrt{\log_{10}\left(\frac{\log_{10} x}{2(3 - \log_{10} x)}\right)}$$

A. $(10^2, 10^3)$

B. $[10^2, 10^3]$

C. $\left[10^2, 10^3\right)$

D. $\left(10, 10^3\right)$

Answer: A

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35. The domain of definition of the function $f(x) = \log_3\left\{-\log_{1/2}\left(1 + \frac{1}{x^{1/5}}\right) - 1\right\}$

A. $(-\infty, 1)$

B. $(0, 1)$

C. $(1, \infty)$

D. none of these

Answer: B

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36. If [x] denote the greater integer less than or equal to x, then the domain of definition of the real valued funciton $f(c) = \log_{[x+1/2]} |x^2 - x - 2|$, is

A. $[3/2, \infty)$

B. $[3/2, 2) \cup (2, \infty)$

C. $(1/2, 2) \cup (2, \infty)$

D. none of these

Answer: B

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37. If $e^x + e^{f(x)} = e$ then domain of f(x) is

A. $(-\infty, 1)$

B. $(-\infty, 0)$

C. $(1, \infty)$

D. none of these

Answer: A

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38. The domain of $f(x) is (0, 1)$. Then the domain of $(f(e^x) + f(1n|x|)$ is $(-1, e)$ (b) $(1, e)$ $(-e, -1)$ (d) $(-e, 1)$

A. $(-1, e)$

B. $(1, e)$

C. $(e, 1)$

D. $(-e, 1)$

Answer: C

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39. The domain of definition of $f(x) = \sqrt{e^{(\cos^{-1}(\log_4 x^2))}}$ is

A. $[1/2, 2]$

B. $[-2, -1/2] \cup [1/2, 2]$

C. $[-2, -1/2]$

D. none of these

Answer: B

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40. The domain of definition of function $f(x) = 4\sqrt{\log_3\left\{\frac{1}{|\cos x|}\right\}}$ is

A. R

B. $R - \{n\pi : n \in Z\}$

C. $R - \left\{(2n+1)\frac{\pi}{2} : n \in Z\right\}$

D. none of these

Answer: C

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41. The domain of definition of $f(x) = \sqrt{\sec^{-1}\left\{\frac{1-|x|}{2}\right\}}$ is

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

B. $[3, \infty)$

C. ϕ

D. $(-\infty, -3] \cup [3, \infty)$

Answer: D

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42. The domain of the function $f(x) = \sqrt{\cos^{-1}\left(\frac{1-|x|}{2}\right)}$ is

A. $[-3, 3]$

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

C. $(-\infty, -3] \cup [3, \infty)$

D. 1

Answer: A

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43. The domain of definiton of the function $f(x) = \cot^{-1}\left\{\frac{x}{\sqrt{x^2 - [x^2]}}\right\}$ is

A. $R - \{\pm\sqrt{n} : n \in N\}$

B. $R - \{\pm\sqrt{n} : n \geq 0, \neq Z)$

C. R

D. $R - \{0\}$

Answer: B

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44. The function $f(x) = \cot^{-1}\sqrt{x(x+3)} + \cos^{-1}\sqrt{x^2+3x+1}$ is defined on the set S, where S is equal to

A. $\{-3, 0\}$

B. $[-3, 0]$

C. $[0, 3]$

D. ϕ

Answer: A

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45. The domain of the definition of the function of the function y (x) given by the equation $2^x + 2^y = 2$ is

A. $0 < x \leq 1$

B. $0 \leq x \leq 1$

C. $-\infty < x \leq 0$

D. $-\infty < x < 1$

Answer: D

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46. The domain of the function $f(x) = \sqrt{\frac{4 - x^2}{[x] + 2}}$ where [x] denotes the greatest integer less than or equal to x,is

A. $[-1, 2]$

B. $(-\infty, -2)$

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

D. none of these

Answer: D

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47. The domain of definition of the function $f(x) = \sqrt{3 - 2^x - 2^{1-x}} + \sqrt{\sqrt{\sin^{-1} x,}}$ is

A. $[0, 1]$

B. $(0, 1]$

C. $[0, 1]$

D. none of these

Answer: A

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48. The domain of definiton of definition of $f(x) = \log_x \cos x$, is

A. $(-\pi/2, \pi/2) - \{1\}$

B. $[-\pi/2, \pi/2] - \{1\}$

C. $(-\pi/2, \pi/2)$

D. none of these

Answer: D

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49. The domain of the function $f(x) = \sin^{-1}\left(\frac{2-|x|}{4}\right) + \cos^{-1}\left(\frac{2-|x|}{4}\right) + \tan^{-1}\left(\frac{2-|x|}{4}\right)$ is

A. $[0, 3]$

B. $[-6, 6]$

C. $[-1, 1]$

D. $[-3, 3]$

Answer: B

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50. The set of all real values of x for which the funciton $f(x) = \sqrt{\sin x + \cos x} + \sqrt{7x - x^2 - 6}$ takes real values is

A. $[1, 3\pi/4] \cup [7\pi/4, 6]$

B. $[1, 3\pi/4] \cup [6 - \pi/4, 6]$

C. $[1, 6]$

D. none of these

Answer: A

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51. If $f(x)$ is defined on $(0, 1]$, then the domain of $f(\sin x)$ is

A. $(2n\pi, (2n+1)\pi), \neq \in Z$

B. $\left((2n+1)\frac{\pi}{2}, (2n+3)\frac{\pi}{2}\right), n \in Z$

C. $((n-1)\pi, (n+1)\pi), n \in Z$

D. none of these

Answer: A

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52. Let $f(x) = \cos^{-1}\left(\frac{x^2}{x^2+1}\right)$. Then , the range of the f , is

A. $(0, \pi/2]$

B. $[-\pi/2, \pi/2]$

C. $[-\pi/2, 0]$

D. none of these

Answer: A

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53. The range of the function $f(x) = \frac{1}{2 - \sin 3x}$ is

A. $(1/3, 1)$

B. $[1/3, 1)$

C. $[1/3, 1]$

D. none of these

Answer: C

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54. The range of the function $f(x) = \log_3\left(5 + 4x - x^2\right)$, is

A. $(0, 2]$

B. $(-\infty, 2]$

C. $(0, 9]$

D. none of these

Answer: B

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55. The range of the function is $f(x) = \log_5\left(25 - x^2\right)$ is

A. $[0, 5]$

B. $[0, 2)$

C. $(0, 2)$

D. none of these

Answer: D

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56. The range of the functions $f: [0, 1] \to R$, given by $f(x) = x^3 - x^2 + 4x + 2\sin^{-1} x$, is

A. $[-\pi - 2, 0]$

B. $[2, 3]$

C. $[0, 4 + \pi]$

D. $[0, 2 + \pi]$

Answer: C

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57. Let $f(x) = 4\cos\sqrt{x^2 - \frac{\pi^2}{9}}$ Then the range of $f(x)$ is

A. $[-1, 1]$

B. $[-4, 4]$

C. $[0, 1]$

D. none of these

Answer: B

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58. The range [परिसर] of the function $f(x) = \tan\sqrt{\frac{\pi^2}{9} - x^2}$, is

A. $[0, \sqrt{3}]$

B. $(0, \sqrt{3})$

C. $[0, \sqrt{3})$

D. $(0, \sqrt{3}]$

Answer: A

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59. Let $f(x) = \sec^{-1}[1 + \cos^2 x]$, wheb denotes the greatest integer function. Then the range of (x) is

A. $[1, 2]$

B. $[0, 2]$

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

D. none of these

Answer: C

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60. The range of the function $f(x) = \sqrt{2-x} + \sqrt{1+x}$

A. $[\sqrt{3}, \sqrt{6}]$

B. $[0, \sqrt{6}]$

C. $(\sqrt{3}, \sqrt{6})$

D. none of these

Answer: A

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61. The range of the function f defined by $f(x) = \left[\frac{1}{\sin\{x\}}\right]$ (where [.] and $\{.\}$, respectively, denote the greatest integer and the fractional part functions) is I, the set of integers N, the set of natural number W, the set of whole numbers {1,2,3,4,...}

A. Z

B. N

C. $\{x : x \geq 0, x \in Z\}$

D. $\{x : x \geq 2, x \in N\}$

Answer: B

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62. If $f(x)$ is a periodic function with peirodic function with period λ then $f(\lambda x + u)$ where μ is any constant is periodic with period $\frac{T}{a}$.

A. λ

B. 1

C. $\frac{\lambda}{a}$

D. none of these

Answer: B

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63. The peroid of the function $f(x) = \left|\cos. \frac{x}{2}\right| + |\sin x|$ is

A. 2π

B. π

C. 4π

D. none of these

Answer: A

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64. Let $f(x) = x(2 - x), 0 \leq x \leq 2$. If the definition of $f(x)$ is extended over the set $R - [0, 2]$ by $f(x + 1) = f(x)$, then f is a

A. periodic function with period 1

B. non-periodic function

C. periodic function with period 2

D. periodic function with period $1/2$

Answer: C

Watch Video Solution

65. The peroid of the function $f(x) = \frac{|\sin x| - |\cos x|}{|\sin x + \cos x|}$ is

A. $\frac{\pi}{2}$

B. 2π

C. π

D. none of these

Answer: C

Watch Video Solution

66. The function $f(x) = 3^{\sin^2\pi + \sin^4\pi x + x - [x]}$ where [x] denotes the greatest interger less than or equal to x, is

A. a periodic function with period 1

B. a periodic function with period 2

C. a periodic function with period $\frac{1}{2}$

D. not a periodic function

Answer: A

Watch Video Solution

67. Period of the function $f(x) = \frac{1}{3}\{\sin 3x + |\sin 3x| + [\sin 3x]\}$ is (where [.] denotes the greatest integer function)

A. $\frac{\pi}{3}$

B. $\frac{2\pi}{3}$

C. $\frac{4\pi}{3}$

D. π

Answer: B

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68. The function $f(\theta) = \cos\left(\pi \sin^3 \theta\right)$, is

A. not periodic

B. periodic and its period is same as that of $\cos\theta$

C. periodic and its period is same as that of $\cos 2\theta$

D. periodic and its period is same as that of $\cos(\pi\theta)$

Answer: C

Watch Video Solution

69. Let $f(x) = \frac{1}{\sqrt{|x-1| - [x]}}$ where[.] denotes the greatest integer funciton them the domain of $f(x)$ is

A. $(-1, 1)$

B. $(-\infty, 1)$

C. $(-\infty, -1)$

D. none of these

Answer: B

Watch Video Solution

70. Let $f(x) = [9^x - 3^x + 1]$ for all $x \in (-\infty, 1)$, then the range of $f(x)$ is, ([.] denotes the greatest integer function).

A. $\{0, 1, 2, 3, 4, 5, 6, 7\}$

B. $\{0, 1, 2, 3, 4, 5, 6\}$

C. $\{1, 2, 3, 4, 5, 6, 7\}$

D. $\{1, 2, 3, 4, 5, 6\}$

Answer: D

Watch Video Solution

71. If $f(x) = \log_{e^2 x}\left(\frac{2\ln x + 2}{-x}\right)$ and $g(x) = \{x\}$ then range of $g(x)$ for existance of $f(g(x))$ is

A. $(0, 2/e)$

B. $(0, 1/e) - \{1/e^2\}$

C. $(0, 3/e)$

D. none of these

Answer: B

Watch Video Solution

72. The domain and range of $f(x) = \cos^{-1}\sqrt{\log_{[x]}\left(\frac{|x|}{x}\right)}$ where[.] denote the greatest integer function are respectively

A. $[1, \infty), [0, \pi/2]$

B. $[2, \infty), [0, \pi/2)$

C. $[2, \infty), \{\pi/2\}$

D. $[1, \infty), \{0\}$

Answer: C

Watch Video Solution

73. period the function $f(x) = \frac{\sin\{\sin(nx)\}}{\tan\left(\frac{x}{n}\right)}$, n $\in$ N, is 6π then $n =$ ------

--

A. 3

B. 2

C. 1

D. none of these

Answer: A

Watch Video Solution

74. If[.] and {.} denote greatest integer and fractional part functions respectively, then the period of $f(x) = e^{\sin 3\pi\{x\} + \tan \pi[x]}$ is

A. $2/3$

B. 1

C. 3

D. none of these

Answer: B

Watch Video Solution

75. The domain of the funciton $f(x)$ given by $3^x + 3^f = \min\left(2t^3 - 15t^2 + 36 + \ - 25, 2 + |\sin t|, 2 \leq t \leq 4\right)$ is

A. $(-\infty, 1)$

B. $(-\infty, \log_3 e)$

C. $(0, \log_3 2)$

D. $(-\infty, \log_3 2)$

Answer: D

Watch Video Solution

76. Let $f: (4, 6) \to (6, 8)$ be a function defined by $f(x) = x + \left[\frac{x}{2}\right]$ where [.] denotes the greatest integer function, then $f^{-1}(x)$ is equal to

A. $x - \left[\frac{x}{2}\right]$

B. $-x - 2$

C. $x - 2$

D. $\frac{1}{x+\left[\frac{x}{2}\right]}$

Answer: C

Watch Video Solution

77. The domain of definition of the function $f(x)=\sqrt{\sin^{-1}(2x)+\frac{\pi}{6}}$ for real-valued x is $\left[-\frac{1}{4},\frac{1}{2}\right]$ (b) $\left[-\frac{1}{2},\frac{1}{2}\right]$ (c) $\left(-\frac{1}{2},\frac{1}{9}\right)$ (d) $\left[-\frac{1}{4},\frac{1}{4}\right]$

A. $[-1/4,1/2]$

B. $[-f1/2,1/2]$

C. $[-1/2,1/9]$

D. $[-1/4,1/4]$

Answer: A

Watch Video Solution

78. The 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. $(1, 7/5]$

Answer: C

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79. If $f(x) = \sin x + \cos x$ and $g(x) = x^2 - 1$, then $g(f(x))$ is invertible in the domain .

A. $[0, \pi/2]$

B. $[-\pi/4, \pi/4]$

C. $[-\pi/4, \pi/2]$

D. $[0, \pi]$

Answer: B

Watch Video Solution

80. 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. $[0, 3]$

Answer: A

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81. If 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. $f(x+2) = f(x-2)$

Answer: B

Watch Video Solution

82. The domain of the function $f(x) = \sin^{-1}\left(\frac{8(3)^{x-2}}{1-3^{2(x-1)}}\right)$ is

A. $(-\infty, 0]$

B. $[2, \infty)$

C. $(-\infty, 0) \cup [2, \infty)$

D. $(-\infty, -1] \cup [1, \infty)$

Answer: C

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83. find the value of the

A. $\pm\sqrt{n\pi}, n \in \{0, 1, 2, \ldots.\}$

B. $\pm\sqrt{n\pi}, n \in \{1, 2, \ldots\}$

C. $\frac{\pi}{2} + 2n\pi, n \in \{\ldots, -2, -1, 0, 1, 2, \ldots\}$

D. $2n\pi, n \in \{\ldots -2, -1, 0, 1, 2, \ldots\}$

Answer: A

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84. Consider the statements : P : There exists some x IR such that f(x) + 2x = 2(1+x2) Q : There exists some x IR such that 2f(x) +1 = 2x(1+x) Then (A) both P and Q are true (B) P is true and Q is false (C) P is false and Q is true (D) both P and Q are false.

A. both P and Q are true

B. P is true and Q is false

C. P is false and Q is true

D. both P and Q are false

Answer: C

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85. Let $f(x) = \sin\left[\frac{\pi}{6}\sin\left(\frac{\pi}{2}\sin x\right)\right]$ for all $x \in \mathbb{R}$

A. Range of f is $\left[-\frac{1}{2}, \frac{1}{2}\right]$

B. Range of fog is $\left[-\frac{1}{2}, \frac{1}{2}\right]$

C. $\lim_{x \to 0} \frac{f(x)}{g(x)} = \frac{\pi}{6}$

D. There is an $x \in R$ such that $(gof)(x) = 1$

Answer: A::B::C

Watch Video Solution

86. Consider the function f defined on the set of all non-negative interger such that $f(0)=1, f(1)=0$ and $f(n)+f(n-1)=nf(n-1)+(n-1)f(n-2)$ for $n \geq 2$, then f(5) is equal to

A. 40

B. 44

C. 45

D. 60

Answer: B

Watch Video Solution

87. In a function $2f(x)+xf\left(\frac{1}{x}\right)-2f\left(\left|\sqrt{2}\sin\left(\pi\left(x+\frac{1}{4}\right)\right)\right|\right)=4\cos^2\left[\frac{\pi x}{2}\right]+x\cos\left(\frac{\pi}{x}\right.$

. Prove that: 1. f(2)+f(1/2)=1 2. f(2)+f(1)=0

A. $f(2)+f\left(\frac{1}{2}\right)=0$

B. $f(1)=-1$ but $f(2), f\left(\frac{1}{2}\right)$ cannot be determined

C. $f(2)+f(1)=f\left(\frac{1}{2}\right)$

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

Answer: C

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88. Let X be the set of all positive such that $f(x+y)=f(xy)$ for all $x \geq 4, y \geq 4$. If $f(8)=9$, then f(9) is equal to.

A. 8

B. 9

C. 81

D. 64

Answer: B

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89. $f(x) = \frac{9^x}{1+9^x}$ then value of $f\left(\frac{1}{2015}\right) + f\left(\frac{2}{2015}\right) \ldots\ldots + f\left(\frac{4029}{2015}\right)$

A. 1007

B. $\frac{4029}{2}$

C. 2014

D. 2015

Answer: D

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90. Range of the function $f(x) = \sqrt{\cos^{-1}\left(\sqrt{\log_4 x}\right) - \frac{\pi}{2}} + \sin^{-1}\left(\frac{1+x^2}{4x}\right)$ is equal to (A) $\left(0, \frac{\pi}{2} + \sqrt{\frac{\pi}{2}}\right]$ (B) $\left[\frac{\pi}{2}, \frac{\pi}{2} + \sqrt{\frac{\pi}{2}}\right]$ (C) $\left[\frac{\pi}{6}, \frac{\pi}{4}\right)$ (D) $\left\{\frac{\pi}{6}\right\}$

A. $\left(0, \frac{\pi}{2} + \sqrt{\frac{\pi}{2}}\right]$

B. $\left[\frac{\pi}{2}, \frac{\pi}{2} + \sqrt{\frac{\pi}{2}}\right]$

C. $\left[\frac{\pi}{6}, \frac{\pi}{2}\right]$

D. $\left\{\frac{\pi}{2}\right\}$

Answer: D

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91. Consider the function g(x) defined as $g(x)\left(x^{2011-1}-1\right) = (x+1)\left(x^2+1\right)\left(x^4+1\right)\ldots\left(x^{2^{2010}}+1\right) - 1$. Then the value of g(2) is equal to

A. 1

B. $2^{2020} - 1$

C. 2^{2020}

D. 2

Answer: B

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92. Let $f(n) = 1 + \frac{1}{2} + \frac{1}{3} + + \frac{1}{n}$. Then $f(1) + f(2) + f(3) + + f(n)$ is equal to $nf(n) - 1$ (b) $(n+1)f(n) - \cap (n+1)f(n) + n$ (d) $nf(n) + n$

A. $nf(n) - 1$

B. $(n+1)f(n) - n$

C. $(n+1)f(n) + n$

D. $nf(n) + n$

Answer: B

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93. The period of the function $f(x) = 4\sin^4\left(\frac{4x-3\pi}{6\pi^2}\right) + 2\cos\left(\frac{4x-3\pi}{3\pi^2}\right)$ is

A. $\frac{3\pi^2}{4}$

B. $\frac{3\pi^3}{4}$

C. $\frac{4\pi^2}{3}$

D. $\frac{4\pi^3}{3}$

Answer: B

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94. If $f(x) = \frac{\log_{[x-1]}(|x|)}{x}$,where [.] denotes the greatest integer function,then

A. $D(f) = [3, \infty), R(f) = \{0, 1\}$

B. $D(f) = [3, \infty), R(f) = [3, \infty), R(f) = \{0\}$

C. $D(f) = (2, \infty), R(f) = \{0, 1\}$

D. $D(f) = (3, \infty), R(f) = \{0\}$

Answer: B

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95. Domain (D) and range (R) of $f(x) = \sin^{-1}\left(\cos^{-1}[x]\right)$, where [.] denotes the greatest integer function, is $D \equiv x \in [1, 2], R \in \{0\}$ D

$\equiv x \in 90, 1], R \equiv \{-1, 0, 1\}$

$\equiv x \in [-1, 1], R \equiv \left\{0, \sin^{-1}\left(\frac{\pi}{2}\right), \sin^{-1}(\pi)\right\}$

$\equiv x \in [-1, 1], R \equiv \left\{-\frac{\pi}{2}, 0, \frac{\pi}{2}\right\}$

A. $[1, 2)$ and $\{0\}$

B. $[0, 1]$ and $\{-1, 0, 1\}$

C. $[-1, 1]$ and $\left\{0, \sin^{-1}\left(\frac{\pi}{2}\right), \sin^{-1}(\pi)\right\}$

D. $[-11]$ and $\left\{-\frac{\pi}{2}, 0, \frac{\pi}{2}\right\}$

Answer: A

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Section II - Assertion Reason Type

1. Statement-1: The period of sinx , cos x is 2π and period of f(x)+g(x) is the LCM of the periods of f(x) and g(x)

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: A

View Text Solution

2. Statement-1: The period of the function $f(x) = \cos[2\pi]^2 x + \cos\left[-2\pi^2\right]x + [x]$ is π, $[x]$ being greatest integer function and [x] is a fractional part of x, is π .

Statement-2: The cosine function is periodic with period 2π

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: D

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3. Statement-1: The domain of definition of the function $f(x) = e^{2x} + \cos^{-1}\left(\frac{x}{2} - 1\right)$, is $(0, 1) \cup (1, 2) \cup (2, 3) \cup (3, 4)$

Statement:- The domain of $\cos^{-1}\left(\frac{x}{2} - 1\right) is [0, 4]$.

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: D

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4. Statement -1: Let f(x) be a function satisfying $f(x - 1) + f(x + 1) = \sqrt{2}f(x)$ for all $x \in R$. Then f(x) is periodic with

period 8. Statement-2: For every natural number n there exists a periodic functions with period n.

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: B

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5. The period of

$$f(x) = \frac{1}{2}\left\{\frac{|\sin x|}{\cos x} + \frac{|\cos|}{\sin x}\right\}, \text{ is}$$

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: B

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6. Statement-1: Every function can be uniquely expressed as the sum of an even function and an odd function.

Statement-2: The set of values of parameter a for which the functions f(x) defined as $f(x) = \tan(\sin x) + \left[\frac{x^2}{a}\right]$ on the set [-3,3] is an odd function is , $[9, \infty)$

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: B

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7. Statement-1: If $ad - bc \neq 0$, then $f(x) = \frac{ax + b}{cx + d}$ cannot attain the value $\left\{\frac{a}{c}\right\}$.

Statement-2: The domain of the function $g(x) = \frac{b - dx}{cx - a}$ is $R - \left\{\frac{a}{c}\right\}$

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: A

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8. Statement-1: The function f(x) given by $f(x) = \sin^{-1}\left\{\log\left(x + \sqrt{x^2+1}\right)\right\}$ is an odd function.

Statement:2 The composition of two odd functions is an odd function.

A. Statement-1 is True, Statement-2 is True, statement-2 is a correct explanation for the statement-1 .

B. Statement-1 is True, Statement-2 is True, statement-2 is not a correct explanation for the statement-1 .

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: A

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Exercise

1. The function $f(x) = \log_{10}\left(\frac{1+x}{1-x}\right)$ satisfies the equation

A. $f(x+2) - 2cd(x+1) + f(x) = 0$

B. $f(x+1) + f(x) = f(x(x+1))$

C. $f(x_1(x_2) = f(x_1 + x_2)$

D. $f(x_1) + f_{x_2} = f\left(\frac{x_1 + x_2}{1 + x_1 x_2}\right)$

Answer: D

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2. $If y = f(x)$ satisfies the condition $f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2}(x \neq 0)$ then $f(x) =$

A. $x^2 - 2$ for all $x \neq 0$

B. $x^2 - 2$ for all x satisfying $|x| \geq 2$

C. $x^2 - 2$ for all x satisfying $|x| < 2$

D. none of these

Answer: B

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3. If $f(x + 2y, x - 2y) = xy,$ then $f(x, y)$ equals

A. $\frac{x^2 - y^2}{8}$

B. $\frac{x^2 - y^2}{4}$

C. $\frac{x^2 + y^2}{4}$

D. $\frac{x^2 - y^2}{2}$

Answer: A

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4. If $f(x) = x - \frac{1}{x}, x \neq 0$ then $f(x^2)$ equals.

A. f(x)+f(-x)

B. $f(x)f(-x)$

C. $f(x) - f(-x)$

D. none of these

Answer: D

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5. A polynomial function f(x) satisfies the condition

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

If f(10)=1001, then f(20)=

A. 2002

B. 8008

C. 8001

D. none of these

Answer: C

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6. The function $f(x) = \max\{(1-x), (1+x), 2\}, x \in (-\infty, \infty)$ is equivalent to

A. $f(x) = \begin{cases} 1-x & x \leq -1 \\ 2 & -1 < x < 1 \\ 1+x & x \geq 1 \end{cases}$

B. $f(x) = \begin{cases} 1+x, x \leq -1 \\ 2, -1 < x < 1 \\ 1-x, x \geq 1 \end{cases}$

C. $f(x) = \begin{cases} 1-x, x \leq -1 \\ 1, -1 < x < 1 \\ 1+x, x \geq 1 \end{cases}$

D. none of these

Answer: A

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7. If $f(x) = x^3 - x$ and $\phi(x) = \sin 2x$, then

A. $\phi(f(2)) = \sin 2$

B. $\phi(f(1)) = 1$

C. $f(\phi(\pi/12)) = -\frac{3}{8}$

D. $f(f(1)) = 2$

Answer: C

Watch Video Solution

8. Let $f(x) = \min\{x, x^2\}$, for every $x \in R$. Then

A. $f(x) = \begin{cases} x, & x \geq 1 \\ x^2, & 0 \leq x < 1 \\ x, & x < 0 \end{cases}$

B. $f(x) = \begin{cases} x^2, x \geq 1 \\ x, x < 1 \end{cases}$

C. $f(x) = \begin{cases} x, x \geq 1 \\ x^2, x < 1 \end{cases}$

D. $f(x) = \begin{cases} x^2, x \geq 1 \\ x, 0 \leq x < 1 \\ x^2, x < 0 \end{cases}$

Answer: A

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9. The domain of the function f(x) given by $f(x) = \frac{\sqrt{4 - x^2}}{\sin^{-1}(2 - x)}$ is

A. [0,2]

B. [0,2)

C. [1,2)

D. [1,2]

Answer: C

Watch Video Solution

10. The domain of the function

$$f(x) = \sqrt{\left\{\frac{-\log_{0.3}(x-1)}{-x^2+3x+18}\right\}} \text{ is}$$

(a) $[2, 6]$ (b) $]2, 6[$

(b) $[2, 6[$ (d) None of these

A. [2,6]

B. (2,6)

C. [2,6)

D. none of these

Answer: B

Watch Video Solution

11. Domain of the function, $f(x) = \left[\log_{10}\left(\frac{5x-x^2}{4}\right)\right]^{\frac{1}{2}}$ is

A. [1,4]

B. (1,4)

C. (0,5)

D. [0,5]

Answer: A

Watch Video Solution

12. If $f: R \to R$ is defined by $f(x) = \frac{1}{2 - \cos 3x}$ for each $x \in R$ then the range of f is

A. $[-1/3, 0]$

B. R

C. [1/3,1]

D. none of these

Answer: C

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13. If the function $f: R \overrightarrow{A}$ given by $f(x) = \frac{x^2}{x^2+1}$ is surjection, then find A.

A. R

B. [0,1]

C. (0,1]

D. [0,1)

Answer: D

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14. The domain of definition of the function

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

A. R

B. $(0, \infty)$

C. $(-\infty, 0)$

D. none of these

Answer: C

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15. The set of values of x for which the function

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

A. R

B. R-{0}

C. ϕ

D. none of these

Answer: C

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16. The function $f(x) = \log_{10}\left(x + \sqrt{x^2 + 1}\right)$ is

A. an even function

B. an odd function

C. periodic function

D. none of these

Answer: B

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17. The function $f(x) = \cos\left\{\log_{10}\left(x + \sqrt{x^2 + 1}\right\}\right.$, is

A. even

B. odd

C. constant

D. none of these

Answer: A

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18. $f(x) = \sqrt{\sin^{-1}(\log_2 x)}$

A. $x \in (1, 2)$

B. $s \in [1, 2]$

C. $x \in [2, \infty)$

D. $x \in (0, \infty)$

Answer: B

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19. The function $f(x) = \sqrt{\cos(\sin x)} + \sin^{-1}\left(\frac{1+x^2}{2x}\right)$ is defined for :

A. $x \in \{-1, 1\}$

B. $x \in [-1, 1]$

C. $x \in R$

D. $x \in (-1, 1)$

Answer: A

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20. The function $f(x) = |\cos|$ is periodic with period

A. 2π

B. π

C. $\frac{\pi}{2}$

D. $\frac{\pi}{4}$

Answer: B

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21. If a funciton f(x) is defined for $x \in [0, 1]$, then the function f(2x+3) is defined for

A. $x \in [0, 1]$

B. $x \in [-3/2, -1]$

C. $x \in R$

D. $x \in [-3/2, 1]$

Answer: B

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22. the period of the $f(x) = \sin^4 x + \cos^4 x$ is

A. π

B. $\pi/2$

C. 2π

D. none of these

Answer: B

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23. Which of the following functions is the inverse of itself? $f(x) = \frac{1-x}{1+x}$ (b) $f(x) = 5^{\log x}$ $f(x) = 2^{x(x-1)}$ (d) None of these

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

B. $g(x) = 5^{\log x}$

C. $h(x) = 2^{x(x-1)}$

D. none of these

Answer: A

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24. If $f(-x) = -f(x)$, then f(x) is

A. an even function

B. an odd function

C. neither odd nor even

D. periodic function

Answer: B

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25. The value of $f(x) = 3\sin\left(\frac{\pi^2}{16} - x^2\right)$ lie in the interval____

A. $[-\pi/4, \pi/4]$

B. $[0, 3/\sqrt{2}]$

C. $(-3, 3)$

D. none of these

Answer: B

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

A. $\frac{f(x)+1}{f(x)+3}$

B. $\frac{3f(x)+1}{f(x)+3}$

C. $\frac{f(x)+3}{f(x)+1}$

D. $\frac{f(x)+3}{3f(x)+1}$

Answer: B

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27. Given $f(x) = \log_{10}\left(\frac{1+x}{1-x}\right)$ and $g(x) = \frac{3x+x^3}{1+3x^2}$, then fog(x) equals

A. $-f(x)$

B. $3f(x)$

C. $[f(x)]^3$

D. none of these

Answer: B

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28. If $f(x) = 2x^6 + 3x^4 + 4x^2$, then f'(x) is

A. an even function

B. an odd function

C. neither even nor odd

D. none of the above

Answer: B

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29. If f(x) is an even function, then the curve y=f(x) is symmetric about

A. x-axis

B. y-axis

C. both the axes

D. none of these

Answer: B

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30. If f(x) is an odd function, then the curve y=f(x) is symmetric

A. about x-axis

B. about y-axis

C. about both the axes

D. in opposite quadrants

Answer: D

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31. Which of the following functions is periodic ?

A. $f(x) = x + \sin x$

B. $f(x) = \cos \sqrt{x}$

C. $f(x) = \cos x^2$

D. $f(x) = \cos^2 x$

Answer: D

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32. Let the function $f(x) = x^2 + x + \sin x - \cos x + \log(1 + |x|)$ be defined on the interval [0,1]. The odd extension of f(x) to the interval [-1,1] is

A. $x^2 + x + \sin x + \cos x - \log(1 + |x|)$

B. $-x^2 + x + \sin x + \cos x - \log(1 + |x|)$

C. $-x^2 + x + \sin x - \cos x + \log(1 + |x|)$

D. none of these

Answer: B

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33. The domain of definition of the function $f(x) = (7 - x)P_{x-3}$, is

A. [3,7]

B. {3,4,5,6,7}

C. {3,4,5}

D. none of these

Answer: C

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34. The range of function $f(x) = {}^{7-x}P_{x-3} is$ {1,2,3} (b) $\{1, 2, 3, 4, 5, 6\}$ $\{1, 2, 3, 4\}$ (d) $\{1, 2, 3, 4, 5\}$

A. {1,2,3}

B. {1,2,3,4,5,6}

C. {1,2,3,4}

D. {1,2,3,4,5}

Answer: A

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35. If $f(x) = \cos^{-1}\left(\frac{2-|x|}{4}\right) + [\log_{10}(3-x)]^{-1}$, then its domain is

A. [-2,6]

B. $[-6, 2) \cup (2, 3)$

C. $[-6, 2]$

D. $[-2, 2) \cup (2, 3]$

Answer: B

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36. If D is the set of all real x such that $1 - e^{\frac{1}{x}-1}$ is positive , then D is equal to

A. $(-\infty, 1]$

B. $(-\infty, 0)$

C. $(1, \infty)$

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

Answer: D

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37. Which of the following functions has period 2π ?

A. $f(x) = \sin\left(2\pi x + \frac{\pi}{3}\right) + 2\sin\left(3\pi x + \frac{\pi}{4}\right) + 3\sin 5\pi x$

B. $f(x) = \sin\frac{\pi x}{3} + \sin\frac{\pi x}{4}$

C. $f(x) = \sin x + \cos 2x$

D. none of these

Answer: C

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38. If $f(x) = a^x$, which of the following equalities do not hold ? (i) $f(x+2) - 2f(x+1) + f(x) = (a-1)^2 f(x)$ (ii) $f(-x)f(x) - 1 = 0$

(iii) $f(x+y) = f(x)f(y)$ (iv) $f(x+3) - 2f(x+2) + f(x+1) = (a-2)^2 f(x+1)$

A. $f(x+2) - 2f(x+1) + f(x) = (a-1)^2 f(x)$

B. $f(-x)f(x) + 1 = 0$

C. $f(x+y)=f(x)+f(y)$

D. $f(x+3)-2f(x+2)+f(x+1)=(a-2)^2 f(x+1)$

Answer: A

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39. The interval in which the function $y=f(x)=\frac{x-1}{x^2-3x+3}$ transforms the real line is

A. $(0,\infty)$

B. $(-\infty,\infty)$

C. $[0,1]$

D. $[-1/3,1]-\{0\}$

Answer: D

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40. Let $f(x) = |x - 1|$. Then,

A. $f\left(x^2\right) = [f(x)]^2$

B. $f(|x|) = |f(x)|$

C. $f(x + y) = f(x) + f(y)$

D. none of these

Answer: D

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41. The function $f: C \to C$ defined by $f(x) = \frac{ax + b}{cx + d}$ for $x \in C$ where $bd \neq 0$ reduces to a constant function if

A. $a = c$

B. $b = c$

C. $ad = bc$

D. $ab = cd$

Answer: C

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42. If f(x)=ax+b and g(x)=cx+d, then f(g(x))=g(f(x)) is equivalent to

A. f(a)=g(c)

B. $f(b) = g(b)$

C. $f(d) = g(b)$

D. $f(c) = g(a)$

Answer: C

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43. $x\dfrac{1+2(x+4)^{-0.5}}{2-(x+4)^{0.5}}+5(x+4)^{0.5}$ Find the domain of the following function

A. R

B. (-4,4)

C. R^+

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

Answer: D

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44. Which of the following functions is not an are not an insjective map(s) ?

A. $f(x) = |x + 1|, x \in [-1, \infty)$

B. $g(x) = x + \frac{1}{x}, x \in (0, \infty)$

C. $h(x) = x^2 + 4x - 5, x \in (0, \infty)$

D. $k(x) = e^{-x}, x \in [0, \infty)$

Answer: B

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45. The maximum possible domain and thecorresponding range of $f(x) = (-1)^x$

A. $D = R, E = [-1, 1]$

B. D=I(the set of integers), E=[-1,1]

C. D=R,E=[-1,1]

D. $D = I, E = \begin{cases} +1 & \text{when } x = 0 \text{ or } even \\ -1 & \text{when x is odd} \end{cases}$

Answer: D

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46. If $f(x)$ is defined on $[0, 1]$ by the rule $f(x) = \{x,$ if x is rational , $1 - x,$ if x is rational ' then for all $x \in [0, 1]$,$f(f(x))$ is

A. constant

B. 1+x

C. x

D. None of these

Answer: C

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

A. even

B. odd

C. both even and odd

D. None of these

Answer: B

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48. The function $f(x) = \frac{\sec^4 x + \cos ec^4 x}{x^3 + x^4 \cot x}$, is

A. even

B. odd

C. neither even nor odd

D. periodic with period π .

Answer: B

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49. Let f(x)=x amd g(x)=|x| for all $x \in R$. Then the function $\phi(x) \text{satisfying} \{\phi(x) - f(x)\}^2 + \{\phi(x) - g(x)\}^2$ =0 is

A. $\phi(x) = x, x \in [0, \infty)$

B. $\phi(x) = x, x \in R$

C. $\phi(x) = -x, x \in (-\infty, 0]$

D. $\phi(x) = x + |x|, x \in R$

Answer: A

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50. Let $f: R \to R$ be a function defined by $f(x) = \frac{|x|^3 + |x|}{1 + x^2}$, then the graph of f(x) lies in the

A. I and II quadrants

B. I and III quadrants

C. II and III quadrants

D. III and IV quadrants .

Answer: A

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51. Let $f(x) = \frac{ax + b}{cx + d}$. Then the $fof(x) = x$, provided that : $(a \neq 0, b \neq 0, c \neq 0, d \neq 0)$

A. d=-a

B. d=a

C. a=b=c=d=1

D. a=b=1

Answer: A

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52. If $f(x) = \left(ax^2 + b\right)^3$, then find the function g such that $f(g(x)) = g(f(x))$.

A. $g(x) = \left(\frac{b - x^{1/3}}{a}\right)^{1/2}$

B. $g(x) = \frac{1}{(ax^2 + b)^3}$

C. $g(x) = \left(ax^2 + b\right)^{1/3}$

D. $g(x) = \left(\frac{x^{1/3} - b}{a}\right)^{1/2}$

Answer: D

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53. If a funciton $f:[2,\infty] \to B$ defined by $f(x) = x^2 - 4x + 5$ is a bijection, then B=

A. R

B. $[1, \infty)$

C. $[4, \infty)$

D. $[5, \infty)$

Answer: B

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54. If $b^2 - 4ac = 0, a > 0$ then the domain of the function $f(x) = \log\left(ax^3 + (a+b)x^2 + (b+c)x + c\right)$ is :

A. $R - \left\{-\frac{b}{2a}\right\}$

B. $R - \left\{ \left\{ -\frac{b}{2a} \right\} \cup \{x | x \geq -1|\} \right\}$

C. $R - \left\{ \left\{ -\frac{b}{2a} \right\} \cap (-\infty, -1] \right\}$

D. none of these

Answer: C

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55. If $f(x) = \sin(\log x)$ then $f(xy) + f\left(\frac{x}{y}\right) - 2f(x)\cos(\log y) =$ (A) $\cos(\log x)$ (B) $\sin(\log y)$ (C) $\cos(\log(xy))$ (D) 0

A. -1

B. 0

C. 1

D. none of these

Answer: B

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56. The domain of the function $f(x) = \sin^{-1}\log_3\left(\frac{x}{3}\right)$ is

A. [1,9]

B. [-1,9]

C. [-9,1]

D. [-9,-1]

Answer: A

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57. The domain of the function $f(x) = \frac{\sec^{-1}x}{\sqrt{x-[x]}}$, where [x] denotes the greatest integers less than or equal to x is defined for all x belonging to

A. R

B. $R - \{(-1,1) \cup \{n : n \in Z\}\}$

C. $R^+ - (0,1)$

D. $R^+ - [n : n \in N]$

Answer: B

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58. The domain of definition of the function $f(x) = 3\sqrt{\frac{2x+1}{x^2-10-11}}$, is

A. $(0, \infty)$

B. $(-\infty, 0)$

C. $R - \{-1, 11\}$

D. R

Answer: C

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59. Let g(x) be a function defined on [-1,1]. If the area of the equilateral triangle with two of its vertices at (0,0) and $(x, g(x))$ is $\frac{\sqrt{3}}{4}$, then the function g(x) , is

A. $\pm\sqrt{1-x^2}$

B. $-\sqrt{1-x^2}$ or $\sqrt{1-x^2}$

C. $\sqrt{1-x^2}$ only

D. $\sqrt{1+x^2}$

Answer: B

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60. The domain of definition of the function

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

A. $1 \leq x \leq 5$

B. $1 < x < 4$

C. $1 \leq x < 4$

D. $1 \leq x \leq 4$

Answer: C

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61. The domain of definition of $f(x) = \sin^{-1}(|x-1|-2)$ is

A. $[-2, 0] \cup [2, 4]$

B. $(-2, 0), \cup (2, 4)$

C. $[-2, 0] \cup [1, 3]$

D. $[-2, 0] \cup [1, 3]$

Answer: A

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62. If $f: R \to R$ are defined by $f(x) = x - [x]$ and $g(x) = [x]$ for $x \in R$, where [x] is the greatest integer not ex-ceeding x, then for every $x \in R$, $f(g(x)) =$

A. x

B. 0

C. f(x)

D. g(x)

Answer: B

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63. The domain of definition $f(x) = \sqrt{\log_{0.4}\left(\frac{x-1}{x+5}\right)} \times \frac{1}{x^2 - 36}$ is

A. $(-\infty, 0) - \{-6\}$

B. $(0, \infty) - \{1, 6\}$

C. $(1, \infty) - \{6\}$

D. $[1, \infty) - \{6\}$

Answer: C

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64. The set of all x for which the none of the functions is defined $f(x) = \log_{(x-1)/(x+3)} 2$ and $g(x) = \frac{1}{\sqrt{x^2 - 9}}$, is

A. $[-3, 2]$

B. [-3,2)

C. (-3,2]

D. (-3,-2)

Answer: A

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65. If $f: R \to R$ is defined by $f(x) = x - [x] - \frac{1}{2}$ for all $x \in R$, where [x] denotes the greatest integer function, then $\left\{x \in R: f(x) = \frac{1}{2}\right\}$ is equal to

A. Z

B. N

C. ϕ

D. R

Answer: C

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66. The domain of definition of $f(x) = \log_{10} \log_{10} \ldots . \log_{10} x$, is

A. $(10^n, \infty)$

B. $\left(10^{n-1}, \infty\right)$

C. $\left(10^{n-2}, \infty\right)$

D. none of these

Answer: D

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67. The domain of the function $f(x) = \log_{10} \log_{10}\left(1 + x^3\right)$ is

A. $(-1, \infty)$

B. $(0, \infty)$

C. $[0, \infty)$

D. $(-1, \infty)$

Answer: B

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68. The domain of definition of the function $f(x) = \log_2\left[-(\log_2 x)^2 + 5\log_2 x - 6\right]$, is

A. $(4, 8)$

B. [4,8]

C. $(0, 4) \cup (8, \infty)$

D. $R - [4, 8]$

Answer: A

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69. The domain of definition of $f(x) = \log_3|\log_e x|$, is

A. $(1, \infty)$

B. $(0, \infty)$

C. (e, ∞)

D. none of these

Answer: D

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70. The domain of definition of the function

$f(x) = \log_3\left\{ -\log_4\left(\frac{6x-4}{6x+5}\right)\right\}$, is

A. $(2/3, \infty)$

B. $(-\infty, -5/6) \cup (2/3, \infty)$

C. $[2/3, \infty)$

D. $(-5/6, 2/3)$

Answer: A

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71. The domain of definition of the function $f(X) = x^{\frac{1}{\log_{10} x}}$, is

A. $(0, 1) \cup (1, \infty)$

B. $(0, \infty)$

C. $[0, \infty)$

D. $[0, 1) \cup (1, \infty)$

Answer: A

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

A. $[-2n\pi, 2n\pi], n \in N$

B. $(2n\pi, (2n+1)\pi), n \in Z$

C. $\left((4n+1)\frac{\pi}{2}, (4n+3)\frac{\pi}{2}\right), n \in Z$

D. $\left((4n-1)\frac{\pi}{2}, (4n+1)\frac{\pi}{2}\right), n \in Z$

Answer: D

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73. If the function $f(x) = \log(x-2) - \log(x-3)$ and $g(x) = \log\left(\frac{x-2}{x-3}\right)$ are identical, then

A. $x \in [2, 3]$

B. $x \in [2, \infty)$

C. $x \in (3, \infty)$

D. $x \in R$

Answer: C

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74. The domain of definition of the function $f(x) = \sin^{-1}\left(\frac{4}{3+2\cos x}\right)$, is

A. $\left[2n\pi - \frac{\pi}{3}, 2n\pi + \frac{\pi}{3}\right], n \in Z$

B. $\left[0, 2n\pi + \frac{\pi}{6}\right], n \in Z$

C. $\left[2n\pi - \frac{\pi}{6}, 0\right], n \in Z$

D. $\left(2n\pi - \frac{\pi}{6}, 2n\pi + \frac{\pi}{6}\right), n \in Z$

Answer: A

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75. The domain of the function $f(x) = \cos^{-1}[\sec x]$, where [x] denotes the greatest integer less than or equal to x, is

A.

$$\{x : x = (2n+1)\pi, n \in Z\} \cup \left\{x : 2m\pi \leq x < 2m\pi + \frac{\pi}{3}, m \in Z\right\}$$

B.

$$\{x : x = 2n\pi, n \in Z\} \cup \{x : 2m\pi < (x = 2n\pi), n \in Z\} \cup \left\{x : 2m\pi <\right.$$

C. $\{x : (2n+1)\pi, n \in Z\} \cup \left\{x : 2m\pi < x < 2m\pi + \frac{\pi}{3}, m \in Z\right\}$

D. none of these

Answer: A

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76. Let f be a real vlaued fuction with domain R such that $f(x+1)+f(x-1)=\sqrt{2}f(x)$ for all $x \in R$, then ,

A. f(x) is a periodic function with period 8

B. f(x) is a periodic function with period 12

C. f(x) is a non-periodic function

D. f(x) is a periodic function with indeterminate period

Answer: A

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77. Let f be a real valued function with domain R satisfying $f(x+k)=1+\left[\left(2-5f(x)+10\{f(x)\}^2-10\{f(x)\}^3+5\{f(x)\}^4-\{f(x\right.\right.$

for all real x and some positive constant k, then the period of the function f(x)

A. a periodic function with period λ

B. a periodic function with period 2λ .

C. not a periodic function

D. a periodic function with indeterminate period.

Answer: B

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78. The function f(x) given by $f(x) = \frac{\sin 8x \cos x - \sin 6x \cos 3x}{\cos x \cos 2x - \sin 3x \sin 4x}$, is

A. periodic with period π

B. periodic with period 2π

C. periodic with period $\pi/2$

D. not periodic

Answer: C

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79. If f(x) and g(x) are two real functions such that $f(x) + g(x) = e^x$ and $f(x) - g(x) = e^{-x}$, then

A. f(x) is an odd function

B. g(x) is an even function

C. f(x) and g(x) are periodic functions.

D. none of these

Answer: D

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80. Let $f(x) = |x-2| + |x-3| + |x-4|$ and $g(x) = f(x+1)$. Then 1. $g(x)$ is an even function 2. $g(x)$ is an odd function 3. $g(x)$ is neither even

nor odd 4. $g(x)$ is periodic

A. g(x) is an even functions

B. g(x) is an odd function

C. g(x) is neither even nor odd

D. g(x) is periodic .

Answer: C

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81. If T_1 is the period of the function $f(x) = e^{3(x-[x])}$ and T_2 is the period of the function $g(x) = e^{3x-[3x]}$ ($[\cdot]$ denotes the greatest integer function), then

A. $T_1 = T_2$

B. $T_1 = \frac{T_2}{3}$

C. $T_1 = 3T_2$

D. none of these

Answer: C

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82. If $f(x) = \sqrt{|3^x - 3^1| - 2}$ and g(x)=tan pi x,` then domain of fog(x) , is

A. $\left[n + \frac{1}{3}, n + \frac{1}{2}\right] \cup \left[n + \frac{1}{2}, n + 1\right], n \in Z$

B. $\left(nx + \frac{1}{4}, n + \frac{1}{2}\right) \cup \left(n + \frac{1}{2}, n + 1\right), n \cup Z$

C. $\left(n + \frac{1}{4}, n + \frac{1}{2}\right) \cup \left[n - \frac{1}{2}, n + 1\right], n \in Z$

D. $\left[n + \frac{1}{4}, x + \frac{1}{2}\right) \cup \left(n + \frac{1}{2}, n + 2\right), n \in Z$

Answer: B

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83. Find the range of $f(x) = \sqrt{\sin(\cos x)} + \sqrt{\cos(\sin x)}$.

A. $\left[\sqrt{\cos 1}, \sqrt{\sin 1}\right]$

B. $\left[\sqrt{\cos 1}, 1 + \sqrt{\sin 1}\right]$

C. $\left[1 - \sqrt{\cos 1}, \sqrt{\sin 1}\right]$

D. none of these

Answer: B

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84. 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. $[2, 3]$

Answer: B

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85. If $f: R \to R$ and $g: R \to R$ are defined by $f(x) = 2x + 3$ and $g(x) = x^2 + 7$, then the values of x such that $g(f(x)) = 8$ are

A. 1,2

B. $-1, 2$

C. $-1, -2$

D. $1, -2$

Answer: C

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86. Suppose $f:[-2,2] \to R$ is defined by $f(x) = \begin{cases} -1 & \text{for} \quad -2 \leq x \leq 0 \\ x-1 & \text{for} \quad 0 \leq x \leq 2 \end{cases}$, then $\{x \in [-2,2] : x \leq 0 \text{ and } f(|x|) = x\} =$

A. $\{-1\}$

B. $\{0\}$

C. $\{-1/2\}$

D. ϕ

Answer: C

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87. If $f:R \to R$ and $g:R \to R$ is given by f(x) =|x| and g(x)=[x] for each $x \in R$ then $\{x \in R : g(f(x)) \leq f(g(x))\}$

A. $Z \cup (-\infty, 0)$

B. $(-\infty, 0)$

C. Z

D. R

Answer: A

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88. If a, b are two fixed positive integers such that $f(a+x) = b + \left[b^3 + 1 - 3b^2 f(x) + 3b\{f(x)\}^2 - \{f(x)\}^3\right]^{\frac{1}{3}}$ for all real x, then prove that $f(x)$ is periodic and find its period.

A. a

B. 2a

C. b

D. 2b

Answer: B

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89. The domain of the function $f(x) = \log_{3+x}\left(x^2 - 1\right)$ is

A. $(-3, -1) \cup (1, \infty)$

B. $[-3, -1) \cup [1, \infty)$

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

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

Answer: C

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90. Period of $f(x) = \sin 3x \cos[3x] - \cos 3x \sin[3x]$ (where[] denotes the greatest integer function), is

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. 1

D. 3

Answer: B

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91. Let $f(x) = \frac{1}{x}$ and $g(x) = \frac{1}{\sqrt{x}}$. Then,

A. f(g(x)) and g(f(x)) have different domains

B. f(g(x)) and g(f(x)) have same domain

C. g(f(x)) is a bijective mapping

D. f(g(x)) is neither odd or even.

Answer: B

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92. Domain of $\left(\sqrt{s^2-4x+3}+1\right)\log_5\left(\frac{x}{5}\right)+\frac{1}{x}\left(\sqrt{8x-2x^2-6}+1\right)\leq 1$ is

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

B. $[1, 3]$

C. {1,3}

D. {1}

Answer: D

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93. The period of the function

$f(x)=\cos 2\pi\{2x\}+\sin 2\pi\{2x\},$

is (where {x} denotes the functional part of x)

A. 1

B. $\frac{\pi}{2}$

C. $\frac{1}{2}$

D. π

Answer: C

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94. If $f(n+2)=\frac{1}{2}\left\{f(n+1)+\frac{9}{f(n)}\right\}, n \in N$ and $f(n)>0$ for all $n \in N$, then $\lim_{n \to \infty} f(n)$ is equal to

A. 3

B. -3

C. $\frac{1}{2}$

D. none of these

Answer: A

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95. Let

$f(x) = \left\{\left(x^2 \sin\left(\frac{\pi x}{2}\right),\ -1 < x < 1, x \neq 0\right), (x|x|, x > 1 \text{ or } x \leq -1)\right.$

. Then ,

A. f(x) is an odd function

B. f(x) is an even function

C. f(x) is neither odd nor even

D. none of these

Answer: A

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Chapter Test

1. The period of the function $f(x) = \sin^4 3x + \cos^4 3x$, is

A. $\pi/2$

B. $\pi/3$

C. $\pi/6$

D. none of these

Answer: C

Watch Video Solution

2. The value of integer n for which the function $f(x) = \frac{\sin x}{\sin\left(\frac{x}{n}\right)}$ has 4π its period is

A. 2

B. 3

C. 5

D. 4

Answer: A

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3. The period of the function $f(x) = \sin\left(\frac{2x+3}{6\pi}\right)$, is

A. 2π

B. 6π

C. $6\pi^2$

D. none of these

Answer: C

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4. The domain of the function $f(x) = \sqrt{\log\left(\frac{1}{|\sin x|}\right)}$

A. $R - \{-\pi, \pi\}$

B. $R - \{n\pi \mid n \in Z\}$

C. $R - \{2n\pi \mid n \in z\}$

D. $(-\infty, \infty)$

Answer: B

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5. Domain of the function $f(x) = \log\left(\sqrt{x-4} + \sqrt{6-x}\right)$

A. [4,6]

B. $(-\infty, 6)$

C. $(2, 3)$

D. none of these

Answer: A

Watch Video Solution

6. Let $f(x) = \dfrac{\sqrt{\sin x}}{1 + 3\sqrt{\sin x}}$ then domain f contains

A. $(0, \pi)$

B. $(-2\pi, -\pi)$

C. $(3\pi, 4\pi)$

D. $(4\pi, 6\pi)$

Answer: A

Watch Video Solution

7. If $f: R \to R$ is defined by $f(x) = [2x] - 2[x]$ for $x \in R$, where [x] is the greatest integer not exceeding x, then the range of f is

A. [0,1]

B. {0,1}

C. $(0, \infty)$

D. $(-\infty, 0]$

Answer: B

Watch Video Solution

8. If N denotes the set of all positive integers and if $f: N \to N$ is defined by $f(n) =$ the sum of positive divisors of n then $f\left(2^k \cdot 3\right)$, where k is a positive integer is

A. $2^{k+1} - 1$

B. $2\left(2^{k+1} - 1\right)$

C. $3\left(2^{k+1} - 1\right)$

D. $4\left(2^{k+1} - 1\right)$

Answer: C

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9. The set of value of a for which the function $f(x) = \sin x + \left[\frac{x^2}{a}\right]$ defined on [-2,2] lies an odd function , is

A. $(4, \infty)$

B. $[-4, 4]$

C. $(-\infty, 4)$

D. none of these

Answer: A

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10. If $f(x) = \begin{cases} -1 & x < 0 \\ 0 & x = 0 \\ 1 & x > 0 \end{cases}$ and $g(x) = x\left(1 - x^2\right)$, then

A.

$$fog(x) = \{(-1, -1 < x < 0 \text{ or } x > 1), (0, x = 0, 1, -1), (1, 0 <$$

B.

$$fog(x) = \{(-1, -1 < x < 0), (0, x = 0, 1, -1), (1, 0 < x < 1)$$

C.

$$fog(x) = \{(-1, \ -1 < x < 0 \text{ or } x > 1), (0, x = 0, 1, \ -1), (1, 0 <$$

D.

$$fog(x) = \{(-1, x < 0 \text{ or } x > 1), (0, x = 0, 1, \ -1), (1, 0 < x < 1$$

Answer: C

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11. Find the equivalent definition of

$f(x) = max x^2, (-x)^2, 2x(1-x) where 0 \leq x \leq 1$

A. $f(x) = \begin{cases} x^2 & 0 \leq x \leq 1/3 \\ 2x(1-x) & 1/3 \leq x \leq 2/3 \\ (1-x)^2 & 2/3 \leq x \leq 1 \end{cases}$

B. $f(x) = \begin{cases} (1-x)^2 & 0 \leq x \leq 1/3 \\ 2x(1-x) & 1/3 \leq x \leq 2/3 \\ x^2 & 2/3 \leq x \leq 1 \end{cases}$

C. $f(x) = \begin{cases} x^2 & 0 \leq x \leq 1/2 \\ (1-x)^2 & 1/2 \leq x \leq 1 \end{cases}$

D. none of these

Answer: B

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12. If f(x) is defined on [0,1], then the domain of $f\left(3x^2\right)$, is

A. $\left[0, 1/\sqrt{3}\right]$

B. $\left[-1/\sqrt{3}, 1/\sqrt{3}\right]$

C. $\left[-\sqrt{3}, \sqrt{3}\right]$

D. none of these

Answer: B

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13. The function $f(x)$ is defined in $[0, 1]$. Find the domain of $f(tanx)$.

A. $[n\pi, n\pi + \pi/4], n \in Z$

B. $[2n\pi, 2n\pi + \pi/4], n \in Z]$

C. $[n\pi - \pi/4, n\pi + \pi/4], n \in Z]$

D. none of these

Answer: A

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14. The domain of definition of the real function $f(x) = \sqrt{\log_{12} x^2}$ of the real variable x, is

A. $x > 0$

B. $|x| > 1$

C. $|x| > 4$

D. $x > 4$

Answer: B

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15. The values of $b and c$ for which the identity of $f(x+1)-f(x)=8x+3$ is satisfied, where $f(x)=bx^2+cx+d, are$ $b=2, c=1$ (b) $b=4, c=-1$ $b=-1, c=4$ (d) $b=-1, c=1$

A. b=2,c=1

B. b=4,c=-1

C. b=-1,c=4

D. b=-1,c=1

Answer: B

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16. The function $f(x)=\sin\frac{\pi x}{2}+2\cos\frac{\pi x}{3}-\tan\frac{\pi x}{4}$ is periodic with period

A. 6

B. 3

C. 4

D. 12

Answer: D

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

A. 4

B. 6

C. 12

D. 24

Answer: A

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18. The equivalent definition of $f(x) = \max . \left\{ -1|1-x^2, 2|x| - 2, 1 - \frac{7}{2}|x| \right\}$, is

A.

$$\{(-2x+2, x-1), (x^2-1, -1 \leq x < 1/2), (1+7x/22, -1/2$$

B.

$$\{(-2x-2, x < -1), (-x^2-1, -1 \leq x < 1/2), (1+7x/22,$$

C.

$$\{(-2x+2, x \leq -1), (x^2-1), -1 \leq x < 0), (1+7x, 0 \leq x <$$

D. none of these

Answer: A

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19. If $x \in R$, then $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is equal to

A. $2\tan^{-1}x$

B. $\begin{cases} -\pi - 2\tan^{-1}x & -\infty < x < -1 \\ 2\tan^{-1}x & -1 \le x \le 1 \\ \pi - 2\tan^{-1}x & 1 < x < \infty \end{cases}$

C. $\begin{cases} -\pi - 2\tan^{-1}x & -\infty < x < -1 \\ 2\tan^{-1}x & -1 \le x \le 1 \\ \pi - 2\tan^{-1}x & 1 < x < \infty \end{cases}$

D. $\begin{cases} -\pi + 2\tan^{-1}x & -\infty < x \le -1 \\ 2\tan^{-1}x & -1 < x < 1 \\ \pi - 2\tan^{-1}x & 1 \le x < \infty \end{cases}$

Answer: B

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20. If $x \in R$, then $f(x) = \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ is equal to

A. $2\tan^{-1}x$

B. $\begin{cases} 2\tan^{-1}x & x \ge 0 \\ -2\tan^{-1}x & x \le 0 \end{cases}$

C. $\begin{cases} \pi + 2\tan^{-1}x & x \ge 0 \\ -\pi + 2\tan^{-1}x & x \le 0 \end{cases}$

D. none of these

Answer: B

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21. The equivalent definition of the function $f(x) = \lim_{n \to \infty} \frac{x^n - x^{-n}}{x^n + x^{-n}}, x > 0$, is

A. $f(x) = \begin{cases} -1 & 0 < x \leq 1 \\ 1 & x > 1 \end{cases}$

B. $f(x) = \begin{cases} -1 & 0 < x < 1 \\ 1 & x \geq 1 \end{cases}$

C. $f(x) = \begin{cases} -1 & 0 < x < 1 \\ 0 & x = 1 \\ 1 & x > 1 \end{cases}$

D. none of these

Answer: C

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22. Find the domain of $\log_{10}\left(1 - \log_{10}\left(x^2 - 5x + 16\right)\right)$

A. (1,3)

B. (2,3)

C. [2,3]

D. none of these

Answer: B

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23. The domain of definition of $f(x) = \log_{0.5}\left\{ -\log_2\left(\frac{3x-1}{3x+2}\right)\right\}$, is

A. $(-\infty, -1/3)$

B. $(-1/3, \infty)$

C. $(1/3, \infty)$

D. $[1/3, \infty)$

Answer: C

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24. The domain of definition of $f(x) = \sqrt{\frac{\log_{0.3}|x-2|}{|x|}}$, is

A. $[1, 2) \cup (2, 3]$

B. $[1, 3]$

C. $R - (1, 3]$

D. none of these

Answer: A

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25. The domain of the function $y = \sqrt{\log_{10}(\log_{10} x) - \log_{10}(4 - \log_{10} x) - \log_{10} 3}$ is

A. $(10^3, 10^4)$

B. $[10^3, 10^4]$

C. $[10^3, 10^4)$

D. $(10^3, 10^4]$

Answer: C

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26. The function $f(x) = \log_{2x-5}(x^2 - 3x - 10)$ is defined for all belonging to

A. $[5, \infty)$

B. $(5, \infty)$

C. $(-\infty, +5)$

D. none of these

Answer: B

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27. The domain of definition of $f(x) = \log_{1.7}\left(\frac{2-\phi'(x)}{x+1}\right)^{1/2}$, where $\phi(x) = \frac{x^3}{3} - \frac{3}{2}x^2 - 2x + \frac{3}{2}$, is

A. $(-\infty, -4)$

B. $(-4, \infty)$

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

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

Answer: C

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28. The domain of definition of $f(x) = \log_{100x}\left(\frac{2\log_{10} x + 1}{-x}\right)$, is

A. $(0, 10^{-2}) \cup \left(10^{-2}, 10^{-1/2}\right)$

B. $\left(0, 10^{-1/2}\right)$

C. $(0, 10^{-1})$

D. none of these

Answer: A

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29. The value of x for which $y = \log_2\left\{-\log_{1/2}\left(1+\frac{1}{x^{1/4}}\right)-1\right\}$ is a real number are

A. [0,1]

B. (0,1)

C. $[1, \infty)$

D. none of these

Answer: B

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30. Find the domain of the function $f(x) = \log_{10}\left(\left(\log_{10} x^2\right) - 5\log_{10} x + 6\right)$

A. $(0, 10^2)$

B. $(10^3, \infty)$

C. $(10^2, 10^3)$

D. $(0, 10^2) \cup (10^3, \infty)$

Answer: D

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31. Domain of the function f(x) = $(x + 0.5)^{\log(0.5+x)}\left(\frac{x^2 + 2x - 3}{4x^2 - 4x - 3}\right)$

A. $(-1/2, 1)$

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

C. $(-1/2 - 1)$

D. none of these

Answer: B

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

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

B. $(1, 2)$

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

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

Answer: A

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33. The equivalent definition of $f(x) = ||x| - 1|$, is

A. $f(x) = \begin{cases} -x - 1 & x \leq -1 \\ x + 1 & -1 < x \leq 0 \\ 1 - x & 0 \leq x \leq 1 \\ x - 1 & x \leq 1 \end{cases}$

B. $f(x) = \begin{cases} x-1 & x \leq -1 \\ x+1 & -1 < x \leq 0 \\ x-1 & 0 \leq x \leq 1 \\ x+1 & x \geq 1 \end{cases}$

C. $f(x) = \begin{cases} x+1 & x \geq 0 \\ x+1 & x \leq 0 \end{cases}$

D. none of these

Answer: A

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34. If $f(x)||x|-1|$, then fof(x) equals

A. $f(x) = \begin{cases} |x|-2 & |x| \leq 2 \\ 2-|x| & 1 < |x| < 2 \\ |x| & |x| \leq 1 \end{cases}$

B. $f(x) = \begin{cases} |x|+2 & |x| \leq 2 \\ |x|-2 & 1 \leq |x| \leq 2 \\ |x| & |x| \leq 1 \end{cases}$

C. $f(x) = \begin{cases} |x|+2 & |x| \geq 2 \\ 2+|x| & 1 \leq |x| \leq 2 \\ |x| & |x| \leq 1 \end{cases}$

D. none of these

Answer: A

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35.

$f(x) = x^2 - 2|x|, g(x) = \min f(t) : 0 \le t \le x, -2 \le x \le 0$ and $\max f$

Sketch the graph of $g(x)$ and discuss its differentiability

A. $\begin{cases} x^2 - 2x & -2 \le x \le -1 \\ -1 & 1 \le x < 0 \\ 0 & 0 \le x2 \\ x^2 + 2x & 2 \le x \le 3 \end{cases}$

B. $\begin{cases} x^2 + 2x & -2 \le x \le -1 \\ -1 & -1 \le x < 0 \\ 0 & 0 \le x < 0 \\ x^2 - 2x & 1 \le x \le 3 \end{cases}$

C. $\begin{cases} x^2 + 2x & -2 \le x \le -0 \\ x^2 - 2x & 0 \le x \le 3 \end{cases}$

D. $\begin{cases} x^2 + 2x & -2 \le x \le 0 \\ 0 & 0 \le x < 2 \\ x^2 - 2x & 2 \le x \le 3 \end{cases}$

Answer: B

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36. Find the range of $f(x) = \sec\left(\frac{\pi}{4}\cos^2 x\right)$, where `-oo

A. $[1, \sqrt{2}]$

B. $[1, \infty)$

C. $[-\sqrt{2}, -1] \cup [1, \sqrt{2}]$

D. $(-\infty, -1] \cup [1, \infty)$

Answer: A

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37. The period of $f(x) = \sin\left(\frac{\pi x}{n-1}\right) + \cos\left(\frac{\pi x}{n}\right), n \in Z, n > 2$, is

A. $2n\pi(n-1)$

B. $4(n-1)\pi$

C. $2n(n-1)$

D. none of these

Answer: C

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38. The function $f(x) = \left(\frac{1}{2}\right)^{\sin x}$, is

A. periodic with period 2π

B. an odd function

C. not expressible as the sum of an even function and an odd function

D. none of these

Answer: A

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39. If $[x]$ and $\{x\}$ represetnt the integral and fractional parts of x, respectively, then the value of $\sum_{r=1}^{2000} \frac{\{x+r\}}{2000}$ is x (b) $[x]$ (c) $\{x\}$ (d) $x + 2001$

A. $\frac{2001}{2}x$

B. $x + 2000$

C. x

D. $[x] + \frac{2001}{2}$

Answer: C

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40. Let $f(x) = \begin{cases} 0 & x = 0 \\ x^2 \sin \pi / 2x & |x| < 1 \\ x|x| & |x| \geq 1 \end{cases}$. Then , f(x) is

A. an even function

B. an odd function

C. neither an even function nor an add function

D. f'(x) is an even function

Answer: B

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41. Let $f(x) = x + 1$ and $\phi(x) = x - 2$. Then the value of x satisfying $|f(x) + \phi(x)| = |f(x)| + |\phi(x)|$ are :

A. $(-\infty, 1]$

B. $[2, \infty)$

C. $(-\infty, -2]$

D. $[1, \infty)$

Answer: B

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42. The domain of definition of the function $f(x) = \tan\left(\frac{\pi}{[x+2]}\right)$, is

A. $[-2, 1]$

B. $(-2, -1)$

C. $R - [-2, -1]$

D. none of these

Answer: D

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43. The range of the function $f(x) = \sin\left\{\log_{10}\left(\frac{\sqrt{4-x^2}}{1-x}\right)\right\}$,is

A. [0,1]

B. (-1,0)

C. [-1,1]

D. (-1,1)

Answer: C

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44. The range of the function $y = \frac{x+2}{x^2-8x+4}$

A. $\left(-\infty, -\frac{1}{4}\right] \cup \left[-\frac{1}{20}, \infty\right)$

B. $\left(-\infty, -\frac{1}{4}\right) \cup \left(-\frac{1}{20}, \infty\right)$

C. $\left(-\infty, -\frac{1}{4}\right] \cup \left(-\frac{1}{20}, \infty\right)$

D. none of these

Answer: B

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45. The range of the function $f(x) = 1 + \sin x + \sin^3 x + \sin^5 x + \ldots\ldots$ when $x \in (-\pi/2, \pi/2)$, is

A. (0,1)

B. R

C. (-2,2)

D. none of these

Answer: B

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46. The period of the function $f(x) = |\sin 3x| + |\cos 3x|$, is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{6}$

C. $\frac{3\pi}{2}$

D. π

Answer: B

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47. The function $f(x) = \begin{cases} 1 & x \in Q \\ 0 & x \notin Q \end{cases}$, is

A. periodic with period 1

B. periodic with period 2

C. not periodic

D. periodic with indetermine period .

Answer: D

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48. Which of the following functions has period π ?

A. $|-\tan x| + \cos 2x$

B. $2\sin\frac{\pi x}{3} + 3\cos\frac{2\pi x}{3}$

C. $6\cos\left(2\pi x + \frac{\pi}{4}\right) + 5\sin\left(\pi x + \frac{3\pi}{4}\right)$

D. $|\tan 2x| + |\sin 4x|$

Answer: A

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49. The function $f(x) = x[x]$, is

A. periodic with period 1

B. periodic with period 2

C. periodic with indeterminate period

D. not- periodic

Answer: D

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50. If $f(x)$ and $g(x)$ are periodic functions with the same fundamental period where $f(x) = \sin \alpha x + \cos \alpha x$ and $g(x) = |\sin x| + |\cos x|$, then α is equal to (1) 0 (2) 2 (3) 4 (4) 8

A. 0

B. 1

C. 2

D. 4

Answer: D

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51. The range of the function $f(x) = \cos ec^{-1}[\sin x] \text{ in } [0, 2\pi]$, where $[\cdot]$ denotes the greatest integer function , is

A. $[0, \pi/2) \cup (\pi, 3\pi/2]$

B. {-pi/2} and {pi/2}

C. $(0, \pi] \cup \{3\pi/2\}$

D. $(\pi/2, \pi) \cup (3\pi/2, 2\pi)$

Answer: B

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52. If $f(\sin x) - f(-\sin x) = x^2 - 1$ is defined for all $x \in R$, then the value of $x^2 - 2$ can be

A. 0

B. 1

C. 2

D. -1

Answer: D

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53. Let $f: [\pi, 3\pi/2] \to R$ be a function given by $f(x) = [\sin x] + [1 + \sin x] + [2 + \sin x]$

Then , the range of f(x) is

A. $\{0, 3\}$

B. $\{1\}$

C. $\{0, 2\}$

D. $\{3\}$

Answer: A

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54. Let the function $f(x) = 3x^2 - 4x + 5\log(1 + |x|)$ be defined on the interval [0,1]. The even extension of f(x) to the interval [0,1]. The even extension of f(x) to the interval [-1,1] is

A. $3x^2 + 4x + 8\log(1 + |x|)$

B. $3x^2 - 4x + 8\log(1 + |x|)$

C. $3x^2 + 4x - 8\log(1 + |x|)$

D. none of these

Answer: D

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55. If $f:[-4,0] \to R$ is defined by $f(x) = e^x + \sin x$, its even extension to $[-4,4]$ is given by :

A. $-e^{|x|} - \sin|x|$

B. $e^{-|x|} - \sin|x|$

C. $e^{-|x|} + \sin|x|$

D. $-e^{-|x|+\sin|x|}$

Answer: B

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56. Which one of the following is not periodic ?

A. $|\sin 3x| + \sin^2 x$

B. $\cos\sqrt{x} + \cos^2 x$

C. $\cos 4x + \tan^2 x$

D. $\cos 2x + \sin x$

Answer: B

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57. The domain of the function $f(x) = \frac{\sin^{-1}(3-x)}{\log_e(|x|-2)}$, is

A. [2,4]

B. $(2, 3) \cup (3, 4]$

C. $[2, 3)$

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

Answer: B

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58. The domain of $f(x) = \log|\log_e x|$, is

A. $(0, \infty)$

B. $(1, \infty)$

C. $(0, 1) \cup (1, \infty)$

D. $(-\infty, 1)$

Answer: C

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59. The period of $\sin^2 \theta$, is

A. π^2

B. π

C. 2π

D. $\pi / 2$

Answer: B

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60. The domain of the function $f(x) = {}^{16-x}C_{2x-1} + {}^{20-3x}P_{4x-5}$, where the symbols have their usual meanings, is the set

A. $\{2, 3\}$

B. $\{2, 3, 4\}$

C. $\{1, 2, 3, 4\}$

D. $\{1, 2, 3, 4, 5\}$

Answer: A

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