MATHS

BOOKS - VK JAISWAL MATHS (HINGLISH)

FUNCTION

Single Choice Problems

1. Range of the function $f(x) = \log_{\sqrt{2}}\left(2 - \log_2 16\sin^2 x + 1\right)$ is:

A. $[0, 1]$

B. $(-\infty, 1]$

C. $[-1, 1]$

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

Answer: B

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2. The values of α and β for which $\left|e^{|x-\beta|}-\alpha\right|=2$ has four distinct solutions are

A. $a \in (-2, \infty), b = 0$

B. $a \in (2, \infty), b = 0$

C. $a \in (3, \infty), b \in R$

D. $a \in (2, \infty)b = 0$

Answer: C

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3. The range of the function : $f(x)=\tan^{-1}x+\frac{1}{2}\sin^{-1}x$

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

B. $[-\pi/2, \pi/2]-\{0\}$

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

D. $(-3\pi/4, 3\pi/4)$

Answer: C

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4. Find the number of real ordered pair(s) (x, y) for which: $16^{x^2+y} + 16^{x+y^2} = 1$

A. 0

B. 1

C. 2

D. 3

Answer: B

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5. The range of values of 'a' such that $\left(\frac{1}{2}\right)^{|x|} = x^2 - a$ is satisfied for maximum number of values of 'x'

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

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

C. $(-1, 1)$

D. $(-1, \infty)$

Answer: D

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6. For a real number x, let [x] denote the greatest integer less than or equal to x. Let f: R $\rightarrow$ R be defined as $f(x) = 2x + [x] + \sin x \cos x$ then f is

A. One-one but not onto

B. onto but not one-one

C. Both one-one and onto

D. Neither one-one nor onto

Answer: A

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7. The maximum value of $\sec^{-1}\left(\frac{7-5(x^2+3)}{2(x^2+2)}\right)$ is:

A. $\frac{5\pi}{6}$

B. $\frac{5\pi}{12}$

C. $\frac{7\pi}{12}$

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

Answer: D

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8. Number of ordered pair (a,b) the set $A = \{1, 2, 3, 4, 5\}$ so that the functon $f(x) = \frac{x^3}{3} + \frac{a}{2}x^2 + bx + 10$ is an injective mapping $\forall x \in R$:

A. `13

B. 14

C. 15

D. 16

Answer: C

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9. let A be the greatest value of the function $f(x) = \log_x [x]$, (where $[.]$ denotes gratest integer function) and B be the least value of the function $g(x) = |\sin x| + |\cos x|$, then :

A. $A > B$

B. $A < B$

C. $A = B$

D. $2A + B = 4$

Answer: C

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10. Let $A = [a, \infty)$ denotes domain, then $f: [a, \infty) \to B,\ f(x) = 2x^3 + 6$ will have an inverse for then smallest real values of a, if:

A. $a = 1,\ B = [5, \infty)$

B. $a = 2,\ B = [10, \infty)$

C. $a,\ 0,\ B = [6, \infty)$

D. $a = \ -1,\ B = [1, \infty)$

Answer: A

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11. Solution of the inequation $\{x\}(\{x\}-1)(\{x\}+2)\geq 0$

where $\{.\}$ denots fractin part function) is :

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

B. $x\in I$ (I denote set of integers)

C. $x\in[0,1)$

D. $x\in[-2,0)$

Answer: B

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12. Let $f(x), g(x)$ be two real valued functions then the function $h(x)=2\max\{f(x)-g((x),0\}$ is equal to :

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

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

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

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

Answer: C

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13. Let $R = \{(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)\}$ be a relation the set $A = \{1, 2, 3, 4\}$. The relation R is

A. a function

B. reflexive

C. not symmetric

D. transitive

Answer: C

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14. The true set of valued of 'K' for which $\sin^{-1}\left(\frac{1}{1+\sin^2 x}\right)=\frac{k\pi}{6}$ may have a solution is :

A. $\left[\frac{1}{4}, \frac{1}{2}\right]$

B. $[1, 2]$

C. $\left[\frac{1}{6}, \frac{1}{2}\right]$

D. $[2, 4]$

Answer: B

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15. A ral valued functin $f(x)$ satisfies the functional equation $f(x-y)=f(x)f(y)-f(a-x)f(x+y)$ where 'a' is a given constant and $f(0)=1$, $f(2a-x)$ is equal to :

A. $-f(x)$

B. $f(x)$

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

D. $f(-x)$

Answer: A

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16. Let $g: R \rightarrow R$ be given by $g(x)=3+4x$ if $g^n(x)=$ gogogo......og (x)

n times. Then inverse of $g^n(x)$ is equal to :

A. $(x+1-4^n).4^{-n}$

B. $(x-1+4^n)4^{-n}$

C. $(x+1+4^n)4^{-n}$

D. None of these

Answer: A

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17. Let $f: D \rightarrow R$ bge defined as : $f(x) = \frac{x^2 + 2x + a}{x^2 + 4x + 3a}$ where D and R denote the domain of f and the set of all the real numbers respectively. If f is surjective mapping. Then the complete range of a is :

A. $0 < a \leq 1$

B. $0 < a \leq 1$

C. $0 \leq a < 1$

D. $0 < a < 1$

Answer: D

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18. If $f: [2, \infty) \rightarrow (-\infty, 4]$, where $f(x) = x(4 - x)$ then find $f^{-1}(x)$

A. $2 - \sqrt{4 - x}$

B. $2 + \sqrt{4 - x}$

C. $-2 + \sqrt{4 - x}$

D. $-2-\sqrt{4-x}$

Answer: A

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19. IF $\{5\sin x] + [\cos x] + 6 = 0,$ then range of $f(x) = \sqrt{3}\cos x + \sin$ x corresponding to solution set of the given equation is: (where $[.]$ denotes greatest integer function)

A. $[-2, -1]$

B. $\left(-\frac{3\sqrt{3}+2}{5}, -1\right)$

C. $[-2, -\sqrt{3})$

D. $\left(-\frac{3\sqrt{3}+4}{5}, -1\right)$

Answer: D

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20. If $f: R \rightarrow R$ where $f(x) = ax + \cos x$ is an invertible function, then

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

B. $[-1, 1]$

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

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

Answer: C

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21. The range of $f(x) = [1 + \sin x] + \left[2 + s \in \frac{2}{x}\right] + \left[3 + s \in \frac{x}{3}\right] + + \left[n + s \in \frac{x}{n}\right] \forall x$, where [.] denotes the greatest integer function, is, $\left\{\frac{n + n - 2^2}{2}, \frac{n(n+1)}{2}\right\}$ $\left\{\frac{n(n+1)}{2}\right\}$ $\left\{\frac{n^2 + n - 2^{\square}}{2}, \frac{n(n+1)}{2} \frac{n^2 + n + 2}{2}\right\}$ $\left[\frac{n(n+1)}{2}, \frac{n^2 + n + 2}{2}\right]$

A. $\left\{\frac{n^2 + n - 2}{2}, \frac{n(n+1)}{2}\right\}$

B. $\left\{\frac{n(n+1)}{2}\right\}$

C. $\left\{\frac{n(n+1)}{2}, \frac{n^2+n+2}{2}, \frac{n^2+n+4}{2}\right\}$

D. $\left\{\frac{n(n+1)}{2}, \frac{n^2+n-2}{2}\right\}$

Answer: D

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22. $f: R \to R$, where $f(x) = \frac{x^2+ax+1}{x^2+x+1}$ Complete set of values of 'a' such that $f(x)$ is onto, is

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

B. $(-\infty, 0)$

C. $(0, \infty)$

D. not possible

Answer: D

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23. If $f(x)$ and $g(x)$ are two function such that $f(x) = \{x\} + [-x]$ and $g(x) = \{x\} \forall x \in R$ and $h(x) = f(g(x))$, then which of the following is incorrect ?

$[.]$ denotes greatest integer function and $\{.\}$ denotes fractional part function)

A. $f(x)$ and $h(x)$ are identical functions

B. $f(x) = g(x)$ has no solution

C. $f(x) + h(x) > 0$ has no solution

D. $f(x) - h(x)$ is a periodic function

Answer: B

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24. Let $A = \{1, 2, 3\}$ and $B = \{a, b\}$

what is the number of non empty relations from A to B

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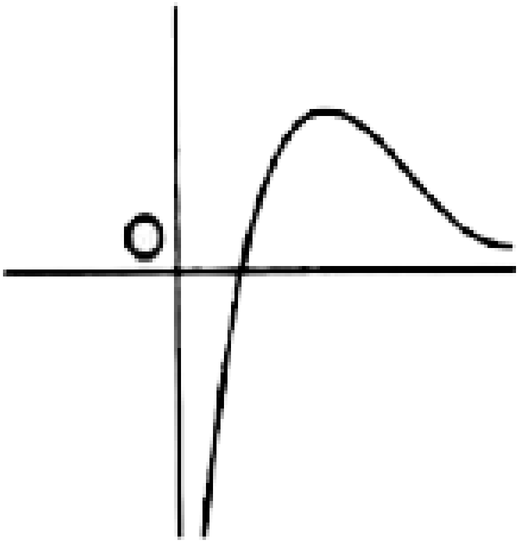
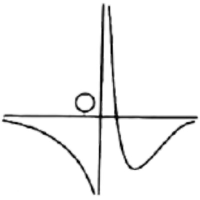
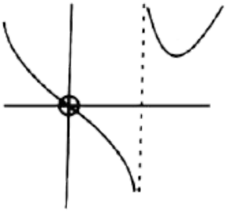
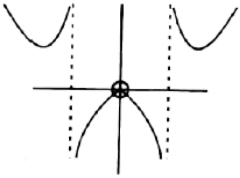
25. The graph of function $f(x)$ is shown below :

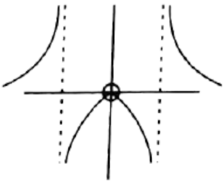


Then the graph of $g(x)=\dfrac{1}{f(|x|)}$ is:

A. 

B. 

C. 

D. 

Answer: C

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26. Which of the following function is homogeneous ?

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

B. $g(x) = xz\frac{y}{x} + ye\frac{x}{y}$

C. $h(x) = \frac{xy}{x+y^2}$

D. $\phi(x) = \frac{x - y\cos x}{y\sin x + y}$

Answer: B

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27. Let $f(x) = \begin{bmatrix} 2x+3 & x>1 \\ \alpha^2 x + 1 & x \le 1 \end{bmatrix}$ If range of $f(x) = R$ (set of real numbers) then number orf integral value(s), which α any take :

A. 2

B. 3

C. 4

D. 5

Answer: C

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28. The maximum integral values of x in the domain of $f(x) = \log_{10}\left(\log_{1/3}(\log_4(x-5)\right)$ is :

A. 5

B. 7

C. 8

D. 9

Answer: C

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29. Range of the function f(x)=$\log_2\left(\frac{4}{\sqrt{x+2}+\sqrt{2-x}}\right)$ is

A. $(0, \infty)$

B. $\left[\frac{1}{2}, 1\right]$

C. $[1, 2]$

D. $\left[\frac{1}{4}, 1\right]$

Answer: B

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30. Number of integers stastifying the equation $\left|x^2+5x\right|+\left|x-x^2\right|=|6x|$ is:

A. 3

B. 5

C. 7

D. 9

Answer: C

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31. If $A = \{2, 1\}$, find $A \times A \times A$

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32. Which of the following function is periodic with fundamental period π ?

A. $f(x) = \cos x \left| \frac{\sin x}{2} \right|$, where [.] denotes greatest integer function

B. $g(x) = \frac{\sin x + \sin 7x}{\cos x + \cos 7x} + |\sin x|$

C. $h(x) = \{x\} + |\cos x|$, where {.} denotes functional part function

D. $\phi(x) = |\cos x| + \ln(\sin x)$

Answer: B

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33. Let $f: N \to Z$ and $f(x) = \begin{bmatrix} \frac{x-1}{2} & \text{when x is odd} \\ -\frac{x}{2} & \text{when x is even} \end{bmatrix}$, then:

A. f (x) is bijective

B. f (x) is injective but not surjective

C. f (x) is not injective but surjective

D. f (x) is neither injective nor subjective

Answer: A

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34. Let $g(x)$ be the inverse of $f(x)=\frac{2^{x+1}-2^{1-x}}{2^x+2^{-x}}$ then g (x) be :

A. $\frac{1}{2}\log_2\left(\frac{2+x}{2-x}\right)$

B. $-\frac{1}{2}\log_2\left(\frac{2+x}{2-x}\right)$

C. $\log_2\left(\frac{2+x}{2-x}\right)$

D. $\log_2\left(\frac{2-x}{2+x}\right)$

Answer: C

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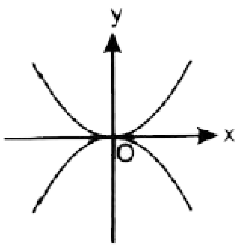
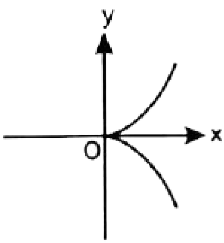
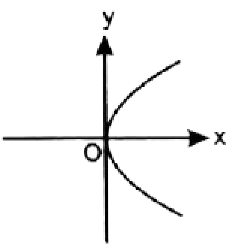
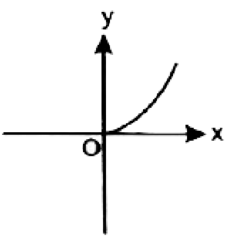
35. Which of the following is the graph of the curve $\sqrt{|y|} = x$ is ?

A. 

B. 

C. 

D. 

Answer: B

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36. Domain of $f(x) = \log_{(x)}(9 - x^2)$ is :

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

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38. If high voltage current is applied on the field given by the grapjh $y + |y| - x - |x| = 0.$ on which of the following curve a person can move so that the ramains safe ?

A. $y = x^2$

B. $y = sgn(-e^2)$

C. $y = \log_{1/3} x$

D. $y = m + |x|, m > 3$

Answer: D

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39. If $\left|f(x) + 6 - x^2\right| = |f(x)| + \left|4 - x^2\right| + 2$, then f(x) is necessarily non-negaive for

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

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

C. $x \in \left[-\sqrt{6}, \sqrt{6}\right]$

D. $x \in [-5, -2] \cup [2, 5]$

Answer: A

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40. Let $f(x) = \cos x + \sin px$ be periodic, then p must be :

A. Positive real number

B. Negative real number

C. Rational

D. Prime

Answer: C

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41. The domain of $f(x) is (0, 1)\cdot$ Then the domain of $(f(e^x) + f(1n|x|)$ is

$(-1, e)$ (b) $(1, e)$ $(-e, -1)$ (d) $(-e, 1)$

A. $\left(\frac{1}{e}, 1\right)$

B. $(-e, 1)$

C. $\left(-1, -\frac{1}{e}\right)$

D. $(-e, -1) \cup (1, e)$

Answer: B

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42. Let $A = \{1, 2, 3, 4\}$ and $f: A \rightarrow$ A satisfy $f(1) = 2, f(2) = 3, f(3) = 4, f(4) = 1$. Suppose $g: A \rightarrow A$ satisfies $g(1) = 3$ and $fog = gof$, then g =

A. $\{(1, 3), (2, 1), (3, 2), (4, 4)\}$

B. $\{(1, 3), (2, 4), (3, 1), (4, 2)\}$

C. $\{(1, 3), (2, 2), (3, 4), (4, 3)\}$

D. $\{(1, 3), (2, 4), (3, 2), (4, 1)\}$

Answer: B

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43. Number of solutions of the equation, $[y+[y]]=2\cos x$ is: (where $y=1/3)[\sin x+[\sin x+[\sin x]]]$ and $[]=$ greatest integer function) 0

(b) 1 (c) 2 (d) ∞

A. 0

B. 1

C. 2

D. Infinite

Answer: A

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44. The function $f(x)=\left\{\frac{(x^{2n})}{(x^{2n}sgnx)^{2n+1}}\left(\frac{e^{\frac{1}{x}}-e^{\frac{1}{x}}}{e^{\frac{1}{x}}+e^{-\frac{1}{x}}}\right)x\neq 0n\in N\right.$ is:

A. Odd function

B. Even function

C. Neither odd nor even function

D. Constant function

Answer: B

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45. Let $A = \{1, 2\}, B = \{1, 2, 3\}, c = \{5, 6\}$ and $d = \{5, 6, 7\}$ verify that

$A \times C$ is a subset of $B \times D$

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46. Let $f(x) = \frac{x}{\sqrt{1 + x^2}}$ then ubrace(fo fo fo ......of)(x) ` is :

A. $\frac{x}{\sqrt{1 + \left(\sum_{r=1}^{n} r\right) x^2}}$

B. $\frac{x}{\sqrt{1 + \left(\sum_{r=1}^{n} 1\right) x^2}}$

C. $\left(\frac{x}{\sqrt{1+x^2}}\right)^n$

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

Answer: B

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47. Let $f: R \to R,$ then $f(x) = 2x + |\cos x|$ is

A. One-one into

B. One-one and onto

C. May-one and into

D. Many-one and onto

Answer: B

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48. Let $f: R \rightarrow R$ be a function defined by $f(x) = x^3 + x^2 + 3x + \sin x$.

Then f is

A. One-one end into

B. One-one and onto

C. Many-one and into

D. many-one and onto

Answer: B

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49. If $f(x) = \{x\} + \{x+1\} + \{x+2\}........\{x+99\}$, then the value of $\left[f\left(\sqrt{2}\right)\right]$ is, where (.) denotes fractional part function & [.] denotes the greatest integer function

A. 5050

B. 4950

C. 41

D. 14

Answer: C

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50. If $|\cot x + \cos ecx| = |\cot x| + \cos ecx|, x \in ||[0, 2\pi],$ then complete set of values of x is :

A. $[0, \pi]$

B. $\left(0, \frac{\pi}{2}\right]$

C. $\left(0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right)$

D. $\left(\pi, \frac{3\pi}{2}\right] \cup \left[\frac{7\pi}{4}, 2\pi\right]$

Answer: C

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51. The funcrtin $f(x) = 0$ has eight distinvt real solution and f also satisfy $f(4 + x) = f(4 - x)$. The sum of all the eight solution of $f(x) = 0$ is :

A. 12

B. 32

C. 16

D. 15

Answer: B

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52. Let f(x) polynomial of degree 5 with leading coefficient unity such that f(1)=5, f(2)=4,f(3)=3,f(4)=2,f(5)=1, then f(6) is equal to

A. 0

B. 24

C. 120

D. 720

Answer: C

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53. Let $f: A \rightarrow B$ be a function such that $f(x) = \frac{(c)}{\sqrt{x-2}} + \sqrt{4-x,}$

is invertible, then which of the following is not possible ?

A. $A = [3, 4]$

B. $A = [2, 3]$

C. $A = [2, 2\sqrt{3}]$

D. $\{2, 2\sqrt{2}]$

Answer: C

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54. Find the number of positive integral values of x satisfying $\left[\frac{x}{9}\right] = \left[\frac{x}{11}\right]$ is where [.] -=GI.F)

A. 21

B. 22

C. 23

D. 24

Answer: D

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55. The domain of function $f(x) = \log_{\left[x+\frac{1}{2}\right]}\left(2x^2 + x - 1\right)$, where $[.]$ denotes the greatest integer function is :

A. $\left[\frac{3}{2}, \infty\right)$

B. $(2, \infty)$

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

D. $\left(\frac{1}{2}, 1\right) \cup (1, \infty)$

Answer: A

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56. The solution set of the equation $[x]^2 + [x+1] - 2 = 0,$ where $[.]$ represents greatest integeral function is :

A. $[-1, o) \cup [1, 2)$

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

C. $[1, 2]$

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

Answer: B

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57. Which among the following relations is a function ?

A. $x^2 + y^2 = r^2$

B. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = r^2$

C. $y^2 = 4ax$

D. $x^2 = dxy$

Answer: D

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58. A function $f: R \to R$ is defined as $f(x) = 3x^2 + 1.$ then $f^{-1}(x)$ is :

A. $\frac{\sqrt{x-1}}{3}$

B. $\left(\frac{1}{2}\sqrt{x} - 1\right.$

C. f^{-1} does not exist

D. $\sqrt{\frac{x-1}{3}}$

Answer: C

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59. If $\begin{cases} 2+x, & x \geq 0 \\ 4-x, & x < 0 \end{cases}$, a then $f(f(x))$ is given by :

A. $f(f(x)) = \begin{cases} 4+x, & x \geq 0 \\ 6-x, & x < 0 \end{cases}$

B. $f(f(x)) = \begin{cases} 4+x, & x \geq 0 \\ x, & x < 0 \end{cases}$

C. $f(f(x)) = \begin{cases} 4-x, & x \geq 0 \\ x, & x < 0 \end{cases}$

D. $f(f(x)) = \begin{cases} 4-x, & x \geq 0 \\ x+2x, & x < 0 \end{cases}$

Answer: A

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60. The function $f: R \rightarrow R$ defined as $f(x) = \dfrac{3x^2+3x-4}{3+3x-4x^2}$ is :

A. One ot one buty not onto

B. Onto but not one to one

C. Both one to one and onto

D. Neither one to one nor onto

Answer: B

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61. The number of solutions of the equation $e^x - \log|x| = 0$ is :

A. 0

B. 1

C. 2

D. 5

Answer: B

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62. If complete solution set of $e^{-x} \leq 4 - x is [\alpha, \beta]$ is equal to : (where [.] denotes greatest integer function)

A. 0

B. 2

C. 1

D. 4

Answer: C

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63. Range of $f(x) = \sqrt{\sin(\log_7(\cos(\sin x)))}$ is:

A. $[0, 1]$

B. $\{0, 1\}$

C. $\{0\}$

D. $[1, 7]$

Answer: C

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64. If the domain of $y = f(x) is [-3, 2]$, then find the domain of $g(x) = f(|[x]|), wher[]$ denotes the greatest integer function.

A. $[-3, 2]$

B. $[-2, 3]$

C. $[-3, 3]$

D. $[-2, 3]$

Answer: B

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65. Range of the function $f(x) = \cot^{-1}\{-x\} + \sin^{-1}\{x\} + \cos^{-1}\{x\}$, where {.} denotes fractional part function:

A. $\left(\frac{3\pi}{4}, \pi\right)$

B. $\left[\frac{3\pi}{4}, \pi\right)$

C. $\left[\frac{3\pi}{4}, \pi\right]$

D. $\left(\frac{3\pi}{4}, \pi\right]$

Answer: D

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66. Let

$f: R - \left\{\frac{3}{2}\right\} \to R, f(x) = \frac{3x+5}{2x-3}. Let f_1(x) = f(x), f_n(x) = f(f_{n-1}(x)$

for $\pi \geq 2, n \in N,$ then $f_{2008}(x) + f_{2009}(x) =$

A. $\frac{2x^2+5}{2x-3}$

B. $\frac{x^2+5}{2x-3}$

C. $\frac{2x^2-5}{2x-3}$

D. $\frac{x^2 - 5}{2x - 3}$

Answer: A

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67. Find the range of the function $f(x) = \frac{(1 + x + x^2)(1 + x^4)}{x^3}$

A. $[0, \infty]$

B. $[2, \infty]$

C. $[4, \infty]$

D. $[6, \infty]$

Answer: D

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68. The function $f:(-\infty, 3] \to (o, e^7]$ defined by $f(x) = e^{x^3 - 3x^2 - 9x + 2}$ is

A. Many one and onto

B. Many one and into

C. One to one and onto

D. One to one and into

Answer: A

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69. If $f(x) = \sin \ln \frac{\sqrt{4 - x^2}}{1 - x}$, then

A. $[-1, 1]$

B. $[0, 1]$

C. $[-1, 1)$

D. None of these

Answer: A

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70. Set of values of 'a' for which the function $f: R \to R,$ given by $f(x) = x^3 + (a+2)x^2 + 3ax + 10$ is one-one is given by :

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

B. $[1, 4]$

C. $[1, \infty]$

D. $[-\infty, 4]$

Answer: B

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71. If the range of the function $F(x) = \tan^{-1}(3x^2 + bx + c)$ is $\left[0, \frac{\pi}{2}\right)$; (domain in R) then :

A. $b^2 = 3c$

B. $b^2 = 4c$

C. $b^2 = 12c$

D. $b^2 = 8c$

Answer: C

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72. Let $f(x) = \sin^{-1} x - \cos^{-1}$, x, then the set of values of k for which of $|f(x)| = k$ has exactly two distinct solutions is :

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

B. $\left(0, \frac{\pi}{2}\right]$

C. $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right)$

D. $\left[\pi, \frac{3\pi}{2}\right]$

Answer: A

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73. Let $f: R \rightarrow R$ is defined by $f(x)=\begin{cases}(x+1)^3 & x \leq 1 \\ \ln x+\left(b^2-3b+10\right) & x>1\end{cases}$ If f (x) is invertible, then the set of all values of 'b' is :

A. $\{1, 2\}$

B. ϕ

C. $\{2, 5\}$

D. None of these

Answer: A

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74. If f(x) is continuous such that $|f(x)| \leq 1, \forall x \in R$ and $g(x) = \dfrac{e^{f(x)} - e^{-|f(x)|}}{e^{f(x)} + e^{-|f(x)|}}$, then range of g(x) is

A. $[0, 1]$

B. $\left[0, \dfrac{e^2+1}{e^2-1}\right]$

C. $\left[0, \dfrac{e^2-1}{e^2+1}\right]$

D. $\left[\dfrac{e^2+1}{e^2+1}, 0\right]$

Answer: D

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75. Consider all function $f: \{1, 2, 3, 4\} \to \{1, 2, 3, 4\}$ which are one-one, onto and satisfy the following property :

If $f(k)$ is odd then $f(k+1)$ is even,$K = 1, 2, 3.$ The number of such function is :

A. 4

B. 8

C. 12

D. 16

Answer: C

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76. Consider the function $f: R - \{1\}$ given by $f(x) = \dfrac{2x}{x-1}$ Then $f'(1)$ =

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77. If rangr of funtion $f(x)$ whose domain is set of all real numbers is $[-2, 4]$, then range of function $g(x) = \dfrac{1}{2} f(2x+1)$ is equal to

A. $[-2, 4]$

B. $[-1, 2]$

C. $[-3, 9]$

D. $[-2, 2]$

Answer: B

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78. Let $f : R \rightarrow$ and $f(x) = \dfrac{x(x^4 + 1)(x + 1) + x^4 + 2}{x^2 + x + 1}$, then $f(x)$ is :

A. one-one, inot

B. Many -one onto

C. One-one, onto

D. Mny one, into

Answer: D

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79. Let f (x) be defined as

$$f(x) = \begin{cases} |x| & 0 \le x < 1 \\ |x-1| + |x-2| & 1 \le x < 2 \\ |x-3| & 2 \le x < 3 \end{cases}$$

The range of function $g(x) = \sin(7(f(x))$ is :

A. $[0, 1]$

B. $[-1, 0]$

C. $\left[-\frac{1}{2}, \frac{1}{2}\right]$

D. $[-1, 1]$

Answer: D

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80. If $[x]^2 - 7[x] + 10 < 0$ and $4[y]^2 - 16[y] + 7 < 0$, then $[x+y]$ cannot be ([.]` denotes greatest integer function):

A. 7

B. 8

C. 9

D. both (b) and (c)

Answer: C

Watch Video Solution

81. Let $f: R \rightarrow R$ be a functino defined by $f(x) = e^{x} - e^{-x}$, then f'(1)=

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82. The function $f(x)$ satisfy the equation $f(1-x) + 2f(x) = 3x \, \forall x \in R$, then $f(0) =$

A. -2

B. -1

C. 0

D. 1

Answer: B

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83. Let $f:[0, 5] \to [0, 5)$ be an invertible function defined by $f(x) = ax^2 + bx + C$, where $a, b, c \in R, abc \neq 0$, then one of the root of the equation $cx^2 + bx + a = 0$ is:

A. a

B. b

C. c

D. $a + b + c$

Answer: A

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84. Let $f(x) = x^2 + \lambda x + \mu \cos x$, λ being an integer and μ is a real number. The number of ordered pairs (λ, μ) for which the equation $f(x) = 0$ and $f(f(x)) = 0$ have the same (non empty) set of real roots is:

A. 2

B. 3

C. 4

D. 6

Answer: C

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85. Consider all function $f: \{1, 2, 3, 4\} \to \{1, 2, 3, 4\}$ which are one-one, onto and satisfy the following property :

If $f(k)$ is odd then $f(k+1)$ is even, $K = 1, 2, 3.$ The number of such function is :

A. 4

B. 8

C. 12

D. 16

Answer: C

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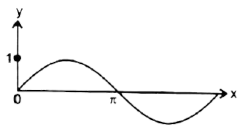
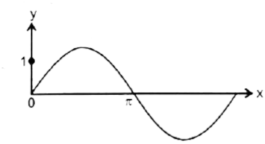
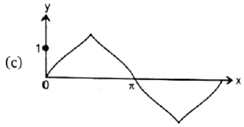
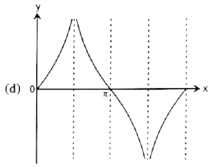
86. Which of the following is closest to the graph of $y = \tan(\sin x), x > 0$?

A. 

B. 

C. 

D. 

Answer: B

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87. Consider the function $f: R - \{1\} \rightarrow R - \{2\}$ given by $f\{x\} = \frac{2x}{x-1}$. Then

A. f is one-one but not onto

B. f is onto but not one-one

C. f is one-one nor onto

D. f is both one-one and onto

Answer: D

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88. If rang of fraction $f(x)$ whose domain is set of all real numbers is $[-2, 4]$, then range of function$g(x) = \frac{1}{2} f(2x+1)$ is equal to :

A. $[-2, 4]$

B. $[-1, .2]$

C. $[-3, 9]$

D. $[-2, 2]$

Answer: B

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89. Let $f : R \rightarrow$ and $f(x) = \frac{x(x^4+1)(x+1)+x^4+2}{x^2+x+1}$, then $f(x)$ is :

A. One-one, into

B. Many one, onto

C. One-one, onto

D. Many one, into

Answer: D

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90. Let f (x) be defined as

$$f(x) = \begin{cases} |x| & 0 \leq x < 1 \\ |x-1| + |x-2| & 1 \leq x < 2 \\ |x-3| & 2 \leq x < 3 \end{cases}$$

The range of function $g(x) = \sin(7(f(x))$ is :

A. $[0, 1]$

B. $[-1, 0]$

C. $\left[-\frac{1}{2}, \frac{1}{2}\right]$

D. $[-1, 1]$

Answer: D

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91. Number of integral values of x in the domain of function $f(x)=\sqrt{\ln(|\ln x|)}+\sqrt{7|x|-(|x|)^2-10}$ is equal to

A. 5

B. 6

C. 7

D. 8

Answer: B

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92. The complete set of values of x in the domain of function $f(x)=\sqrt{\log_{x+2(x)}\left([x]^2-5[x]+7\right)}$ where [.] denote greatest integer functioon and $\{.\}$ denote fraction pert function) is :

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

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

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

D. $\left(-\frac{1}{3}, 0\right) \cup \left(\frac{1}{3}, 1\right) \cup (1, \infty)$

Answer: D

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93. The number of integral ordered pair (x,y) that satisfy the system of equatin $|x+y-4| = 5 \text{ and } |x-3| + |y-1| = 5$ is/are:

A. 2

B. 4

C. 6

D. 12

Answer: D

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94. $f: R \to R$, where $f(x) = \frac{x^2 + ax + 1}{x^2 + x + 1}$ Complete set of values of 'a' such that $f(x)$ is onto, is

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

B. $(-\infty, 0)$

C. $(0, \infty)$

D. Empty set

Answer: D

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95. If A={1,2,3,4} and f : A->A, then total number of invertible functions,'f',such that $f(2) \neq 2, f(4) \neq 4, f(1) = 1$ is equal to:

A. 1

B. 2

C. 3

D. 4

Answer: C

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96. The domian of definition of $f(x) = \log_{(x^2 - x - 1)}(2x^2 - 7x + 9)$ is :

A. R

B. $R - \{0\}$

C. $R - \{0, 1\}$

D. $R - \{1\}$

Answer: C

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97. If $A = \{1, 2, 3, 4\}$ and $B = \{1, 2, 3, 4, 5, 6\}$ are two sets and function $f: A \to B$ is defined by $f(x) = x + 2, \forall x \in A,$ then the function f is

A. 182

B. 181

C. 183

D. None of these

Answer: B

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98. Let $f\left(x0 = x^2 - 2x - 3, x \geq 1$ and $g(x) = 1 + \sqrt{x + 4}, x \geq -4$ then the number of real solution os equation $f(x) = g(x)$ is/are

A. 0

B. 1

C. 2

D. 4

Answer: B

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One Or More Than One Answer Is Are Correct

1. f (x) is an even periodic function with period 10 In $[0, 5], f(x) = \begin{cases} 2x & 0 \leq x < 2 \\ 3x^2 - 8 & 2 \leq x < 4 \\ 10x & 4 \leq x \leq 5 \end{cases}$. Then:

A. $f(-4) = 40$

B. $\dfrac{f(-13) - f(11)}{f(13) + f(-11)} = \dfrac{17}{21}$

C. $f(5)$ is not defined

D. Range of $f(x)$ is $[0, 50]$

Answer: A::B::D

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2. Let $f(x) = \left|\left|x^2 - 4x + 3\right| - 2\right|$. Which of the following is/are correct ?

A. $f(x) =$ m has exactly two real solutios of different sign $\forall m > 2$

B. $f(x) = m$ has exactly two real solution $\forall m \in (2, \infty) \cup \{0\}$

C. $f(x) = m$ has no solutions $\forall m < 0$

D. $f(x) = m$ has four distinct real solution $\forall m \in (0, 1)$

Answer: A::B::C

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3. Let $f(x) = \cos\&^{-1}\left(\frac{1 = -\tan^2(x/2)}{1 + \tan^2(x/2)}\right)$

Which of the following statement (s) is/are correct about $f(x)$?

A. Domain is R

B. Range is $[0, \pi]$

C. $f(x)$ is even

D. $f(x)$ is dervable in $(\pi, 2\pi)$

Answer: C::D

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4. $|\log_e|x|| = |k-1| - 3$ has four distict roots then k satisfies : (where $|x| < d^2, x \neq 0)$

A. $(-4, -2)$

B. $(4, 6)$

C. (e^{-1}, e)

D. (d^{-2}, e^{-1})

Answer: A::B

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5. Which of the following funjctions are difined for all $x \in R$?

(Where$[.]$ = denotes greatest integer function)

A. $f(x) = \sin[x] + \cos[x]$

B. $f(x) = \sec^{-1}(1 + \sin^2 x)$

C. $f(x) = \sqrt{\frac{9}{8} + \cos x + \cos 2x}$

D. $f(x) = \tan(ln(1 + |x|))$

Answer: A::B::C

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6. Let $f(x) = \begin{cases} x^2 & 0 < x < 2 \\ 2x - 3 & 2 \leq x < 3 \\ x + 2 & x \geq 3 \end{cases}$ then the tuue equations:

A. $f\left(f\left(f\left(\frac{3}{2}\right)\right)\right) = f\left(\frac{3}{2}\right)$

B. $1+f\left(f\left(f\left(\frac{5}{2}\right)\right)\right)=f\left(\frac{5}{2}\right)$

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

D. $\underbrace{f(f(f(\ldots\ldots f(4))\ldots))}=2012$

Answer: A::B::C::D

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7. Let $f:\left[\frac{2\pi}{3},\frac{5\pi}{3}\right]\to[0,4]$ be a function difined as $f(x)=\sqrt{3}\sin x-\cos x+2,$ then :

A. $f^{-1}(1)=\frac{4\pi}{3}$

B. $f^{-1}(1)=\pi$

C. $f^{-1}(2)=\frac{5\pi}{6}$

D. $f^{-1}(2)=\frac{7\pi}{6}$

Answer: A::D

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8. Let $f(x)$ be invertible function and let $f^{-1}(x)$ be is inverse. Let equation $f(f^{-1}(x)) = f^{-1}(x)$ has two real roots α and β (with in domain of $f(x)$), then :

A. $f(x) = x$ also have same two rreal roots

B. $f^{-1}(x) = x$ also have same two real roots

C. $f(x) = f^{-1}(x)$ also have same two real roots

D. Area of triangle formed by $(0, 0), (\alpha, f(\alpha))$, and $(\beta, f(\beta))$ is 1 unit

Answer: A::B::C

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9. Find the value of $\cos^{-1}\left(\frac{x}{2} + \frac{\sqrt{3 - 3x^2}}{2}\right)$

A. Range of $f(x) is \left[\frac{\pi}{3}, \frac{10\pi}{3}\right]$

B. Rang $f(x) is \left[\frac{\pi}{3}, \frac{5\pi}{3}\right]$

C. f (x) is one-one for $x \in \left[-1, \frac{1}{2}\right]$

D. f (x) is one-one for $x \in \left[\frac{1}{2}, 1\right]$

Answer: B::C

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10. Let $f: R \rightarrow R$ defined by $f(x) = \cos^{-1}(-\{-x\})$, where {x} denotes fractional part of x. Then, which of the following is/are correct?

A. f is many coe but not even function

B. Eange of f contains two prime numbers

C. f is a periodic

D. Graph of f does not lie below x-axis

Answer: A::B::D

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11. Which option (s) is/are ture ?

A. $f: R \to R, f(x) = e^{|x|} - e^{-x}$ is many-one into function

B. $f: R \to R, f(x) = 2x + |\sin x|$ is one-one onto

C. $f: R \to R, f(x) = \frac{x^2 + 4x + 30}{x^2 - 8x + 18}$ is many-one onto

D. $f: R \to R, f(x) = \frac{2x^2 - x + 5}{7x^2 + 2x + 10}$ is many-one into

Answer: A::B::D

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12. If $f(x) = \left[\frac{\ln(x)}{e}\right] + \left[\frac{\ln(e)}{x}\right]$, where [.] denotes greatest interger function, the which of the following are ture ?

A. range of $h(x) is \{-1, 0\}$

B. If $h(x) = -1,$ then x can be rational as well as irractional

C. If $h(x) = -1,$ then x can be rational as well as irrational

D. $h(x)$ is periodic function

Answer: A::C

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13. If $f\left(x0 = \begin{cases} x^3 & x \neq Q \\ -x^3 & x \neq Q \end{cases}\right.$, then :

A. f (x) is periodic

B. f (x) is many-one

C. f (x) is one-one

D. range of the function is R

Answer: C::D

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14. Let f(x) be a real valued function such that $f(0)=\frac{1}{2}$ and f(x+y)=f(x)f(a-y)+f(y)f(a-x), $\forall x, y \in R$, then for some real a,

A. f (x) is perodic function

B. f (x) is a constant function

C. $f(x)=\frac{1}{2}$

D. $f(x)=\frac{\cos x}{2}$

Answer: A::B::C

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15. f (x) is an even periodic function with period 10 In $[0, 5], f(x)=\begin{cases}2x & 0 \leq x < 2 \\ 3x^2-8 & 2 \leq x < 4 \\ 10x & 4 \leq x \leq 5\end{cases}$. Then:

A. $f(-4)=40$

B. $\frac{f(-13)-x(11)}{f(13)+f(-11)}=\frac{17}{21}$

C. $f(5)$ is not defined

D. Range of $f(x)$ is $[0, 50]$

Answer: A::B::D

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16. For the equation $\frac{e^{-x}}{1+x} = \lambda$ which of the following statement (s) is/are correct ?

A. when $\lambda \in (0, \infty)$ equation has 2 real and distinct roots

B. when $\lambda \in \left(-\infty, -e^2\right)$ equation has 2 real anddistinct roots

C. when $\lambda \in (0, \infty)$ equatio has 1 real root

D. when $\lambda \in (-e, 0)$ equation has no real root

Answer: B::C::D

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17. . For $x \in R^{+}$, if $x, [x], \{x\}$ are in harmonic progression then the value of x can not be equal to (where [*] denotes greatest integer function, {*} denotes fractional part function)

A. $\frac{1}{\sqrt{2}}\tan\frac{\pi}{8}$

B. $\frac{1}{\sqrt{2}}\cot\frac{\pi}{8}$

C. $\frac{1}{\sqrt{2}}\tan\frac{\pi}{12}$

D. $\frac{1}{\sqrt{2}}\cot\frac{\pi}{12}$

Answer: A::C::D

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18. The equation $||x-1|+a|=4, a \in R,$ has :

A. 3 distinet real roots for unique value of a.

B. 4 distinct real roots for $a \in (-\infty, -4)$

C. 2 distinct real roots for $|a| < 4$

D. no rela roots for $a > 4$

Answer: A::B::C::D

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19. Let $f_n(x) = (\sin x)^{1/\pi}, x \in R,$ then:

A. $f_2(x) > 1$ for all$x \in \left(2k\pi, (4k+1)\frac{\pi}{2}\right), k \in I$

B. $f_2(x) = 1$ for $x = 2k\pi, k \in I$

C. $f_2(x) > f_3(x)$ for all $x \in \left(2k\pi, (4k+1)\frac{\pi}{2}\right), k \in I$

D. $f_3(x) \geq f_5(x)$ for all $x \in \left(3k\pi(4k+1)\frac{\pi}{2}\right), k \in I$

Answer: A::B

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20. If the domain of $f(x) = \frac{1}{\pi}\cos^{-1}\left[\log_3\left(\frac{x^3}{3}\right)\right]$ where, $x > 0$ is [a,b] and the range of $f(x)$ is [c,d], then :

A. a,b are the roots of the equation $x^4 - 3x^4 - 3xc^3 - x + 3 = 0$

B. a,b are the roots of the equatin $x^4 - x^3 + x^2 - 2x + 1 = 0$

C. $a^3 + d^3 = 1$

D. $a^2 + b^2 + c^2 = 11$

Answer: A::D

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21. The number of real values of x satisfying the equation ; $\left[\frac{2x+1}{3}\right] + \left[\frac{4x+5}{6}\right] = \frac{3x-1}{2}$ are greater than or equal to {[*] denotes greatest integer function):

A. 7

B. 8

C. 9

D. 10

Answer: A::B::C

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22. Let $f\left(x = \sin^6\left(\frac{x}{4}\right) + \cos^6\left(\frac{x}{4}\right). Iff f^n(x)$ denotes n^{th} derivative of f evaluated at x. Then which of the following hold ?

A. $f^{2014}(0) = -\frac{3}{8}$

B. $f^{2015}(0) = \frac{3}{8}$

C. $f^{2010}\left(\frac{\pi}{2}\right) = 0$

D. $f^{2011}\left(\frac{\pi}{2}\right) = \frac{3}{8}$

Answer: A::C::D

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23. Which of the following is (are) incorrect ?

A. If $f(x) = \sin x$ and $g(x) =$ in x then range of $g(f(x))$ is $[-1, 1]$

B.

C. If $f(x) = \left(2011 - x^{2012}\right)^{\frac{1}{2012}}$ then $f(f(2)) = \frac{1}{2}$

D. The function $f: R \to R$ defined as $f(x) = \frac{x^2 + 4x + 30}{x^2 - 8x + 18}$ is not surjective.

Answer: A::B

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24. If [x] denotes the integral part of x for real x, and

$$S = \left[\frac{1}{4}\right] + \left[\frac{1}{4} + \frac{1}{100}\right] + \left[\frac{1}{4} + \frac{1}{100}\right] + \left[\frac{1}{4} + \frac{3}{200}\right] \ldots . + \left[\frac{1}{4} + \frac{199}{200}\right.$$

then

A. S is a composite number

B. Exponent of S in 100 is 12

C. Number of factors of S is 10

D. ${}^{25}C_r$ is max when $r = 51$

Answer: A::B

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25. Let $f(x) = \log_{\{x\}}[x]$

$g(x) = \log_{\{x\}} - \{x\}$

$h(x)\log_{\{x\}}\{x\}$

where $[], \{\}$ denotes the greatest integer function and fractional part function respectively.

For $x \in (1, 5) the f(x)$ is not defined at how many points :

A. 5

B. 4

C. 3

D. 2

Answer: C

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Comprehension Type Problems

1. Let $f(x) = \log_{\{x\}}[x]$

$g(x) = \log_{\{x\}} - \{x\}$

$h(x)\log_{\{x\}}\{x\}$

where $[], \{\}$ denotes the greatest integer function and fractional part function respectively.

If $A = \{x : x \in \text{ domine of } f(x)\})$ and $B\{x : x \text{ domine of } g(x)\}$ then $\forall x \in (1, 5), A - B$ will be :

A. $(2, 3)$

B. $(1, 3)$

C. $(1, 2)$

D. None of these

Answer: D

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2. Let $f(x) = \log_{\{x\}}[x]$

$g(x) = \log_{\{x\}} - \{x\}$

$h(x)\log_{\{x\}}\{x\}$

where $[]$, $\{\}$ denotes the greatest integer function and fractional part function respectively.

Domine of $h(x)$ is :

A. $[2, \infty)$

B. $[1, \infty)$

C. $[2, \infty) - \{I\}$

D. $R^+ - \{I\}$

Answer: C

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3. θ is said to be well behaved if it lies in interval $\left[0, \frac{\pi}{2}\right]$. They are intelligent if they make domain of $f + g$ and g equal. The vlaue of θ for which $h(\theta)$ is defined are handosome. Let

$f(x) = \sqrt{\theta x^2 - 2\left(\theta^2 - 3\right)x - 12\theta}, g(x) = \ln\left(x^2 - 49\right),$

$h(\theta)\ln\left[\int_0^\theta 4\cos^2 t dt - \theta^2\right]$, where θ is in radians.

Complete set of vlaues of θ which are well behaved as well as intellignent is:

A. $\left[\frac{3}{4}, \frac{\pi}{2}\right]$

B. $\left[\frac{3}{5}, \frac{7}{8}\right]$

C. $\left[\frac{5}{6}, \frac{\pi}{2}\right]$

D. $\left[\frac{6}{7}, \frac{\pi}{2}\right]$

Answer: D

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4. θ is said to be well behaved if it lies in interval $\left[0, \frac{\pi}{2}\right]$. They are intelligent if they make domain of $f+g$ and g equal. The vlaue of θ for which $h(\theta)$ is defined are handosome. Let

$f(x)=\sqrt{\theta x^2-2\left(\theta^2-3\right) x-12 \theta}, g(x)=\ln \left(x^2-49\right)$,

$h(\theta) \ln \left[\int_0^\theta 4 \cos ^2 t d t-\theta^2\right]$, where θ is in radians.

Complete set of alues of θ which are intelligent is :

A. $\left[\frac{6}{7}, \frac{7}{2}\right]$

B. $\left(0, \frac{\pi}{3}\right]$

C. $\left[\frac{1}{4}, \frac{6}{7}\right]$

D. $\left[\frac{1}{2}, \frac{\pi}{2}\right]$

Answer: A

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5. θ is said to be well behaved if it lies in interval $\left[0, \frac{\pi}{2}\right]$. They are intelligent if they make domain of $f+g$ and g equal. The vlaue of θ for which $h(\theta)$ is defined are handosome. Let

$$f(x)=\sqrt{\theta x^2-2(\theta^2-3)x-12\theta,}\ g(x)=\ln(x^2-49),$$

$$h(\theta)\ln\left[\int_0^\theta 4\cos^2 t dt-\theta^2\right],$$ where θ is in radians.

Complete set of values of θ which are well behaved, intelligent adn handsome is :

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

B. $\left[\frac{6}{7},\frac{\pi}{2}\right]$

C. $\left[\frac{3}{4},\frac{\pi}{2}\right]$

D. $\left[\frac{3}{5},\frac{\pi}{2}\right]$

Answer: B

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6. Let $f(x)=2-|x-3|, 1\leq x\leq 5$ and for rest of the values f(x) can be obtained by using the relation $f(5x)=\alpha f(x)\,\forall x\in R$ The maximum value of $f(x)$ in $[5^4,5^5]$ for $\alpha=2$ is

A. 16

B. 32

C. 64

D. 8

Answer: B

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7. Let $f(x) = 2 - |x - 3|, 1 \leq x \leq 5$ and for rest of the values f(x) can be obtained by using the relation $f(5x) = \alpha f(x) \forall x \in R$ The maximum value of $f(x)$ in $\left[5^4, 5^5\right]$ for $\alpha = 2$ is

A. 1118

B. 2007

C. 1050

D. 132

Answer: A

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8. An even periodic functin $f : R \rightarrow R$ with period 4 is such that

$$f(x) = \begin{bmatrix} \max . (|x|, x^2) & 0 \leq x < 1 \\ x & 1 \leq x \leq 2 \end{bmatrix}$$

The value of $\{f(5.12)\}$ (where {.} denotes fractional part function), is :

A. $\{f(3.26)\}$

B. $\{f(7.88)\}$

C. $\{f(2.12)\}$

D. $\{f(5.88)\}$

Answer: B

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9. An even periodic functin $f: R \rightarrow R$ with period 4 is such that

$$f(x) = \begin{bmatrix} \max . (|x|, x^2) & 0 \leq x < 1 \\ x & 1 \leq x \leq 2 \end{bmatrix}$$

The number of solution of $f(x)|3 \sin x|$ for $x \in (-6, 6)$ are :

A. 5

B. 3

C. 7

D. 9

Answer: C

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10. Let $f(x) = \dfrac{2|x| - 1}{x - 3}$

Range of $f(x)$:

A. $R - \{3\}$

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

C. $\left(-2, \frac{1}{3}\right]$ uu (2,oo)`

D. R

Answer: B

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11. Let $f(x) = \frac{2|x| - 1}{x - 3}$

Range of the values of 'k' for which $f(x) = k$ has exactly two distinct solutions:

A. $\left(-2\frac{1}{3}\right)$

B. $(-2, 1]$

C. $\left(0, \frac{2}{3}\right]$

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

Answer: A

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12. Let $f(x)$ be a continuous function (define for all x) which satisfies

$f^3(x) - 5f^2(x) + 10f(x) - 12 \geq 0$, $f^2(x) + 3 \geq 0$ and $f^2(x) - 5f(x) +$

If distinct positive number b_1, b_2 and b_3 ar in G.P. then

$f(1) + \ln b_{91})$, $f(2) + \ln b_2$, $f(3) + \ln b_3$ are in :

A. A.P.

B. G.P.

C. H. P.

D. A. G. P.

Answer: A

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13. Let $f(x)$ be a continuous function (define for all x) which satisfies

$f^3(x) - 5f^2(x) + 10f(x) - 12 \geq 0$, $f^2(x) + 3 \geq 0$ and $f^2(x) - 5f(x) +$

The equation of tangent that can be drawn from $(2, 0)$ on the curve $y = x^2 f(\sin x)$ is :

A. $y = 24(x + 2)$

B. $y = 12(x + 2)$

C. $y = 24(x - 2)$

D. $y = 12(x - 2)$

Answer: C

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14. Let $f: [2, \infty) \to \{1, \infty)$ defined by $f(x) = 2^{x^4 - 4x^3}$ and $g: \left[\frac{\pi}{2}, \pi\right] \to A$ defined by $g(x) = \frac{\sin x + 4}{\sin x - 2}$ be two invertible functions, then

$f^{-1}(x)$ is equal to

A. $\sqrt{2 + \sqrt{4 - \log_2 x}}$

B. $\sqrt{2 + \sqrt{4 + \log_2 x}}$

C. $\sqrt{4+\sqrt{4+\log_2 x}}$

D. $\sqrt{4-\sqrt{2+\log_2 x}}$

Answer: B

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15. Let $f:[2,\infty)\to\{1,\infty)$ defined by $f(x)=2^{x^4-4x^3}$ and $g:\left[\frac{\pi}{2},\pi\right]\to A$ defined by $g(x)=\frac{\sin x+4}{\sin x-2}$ be two invertible functions, then

The set "A" equals to

A. $[5, 2]$

B. $[-2, 5]$

C. $[-5, 2]$

D. $[-5, -2]$

Answer: D

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Matching Type Problems

1. If $x, y, z \in R$ satisfies the system of equations $x + (y) + (s) = 12.7, [x] + \{y\} + z = 4.1$ and $\{x\} + y + [z] = 2$ where {.} and [.] denotes the fractional and integral parts respectively) then match the following

	Column-I		Column-II
(A)	$\{x\} + \{y\} =$	(P)	7.7
(B)	$[z] + [x] =$	(Q)	1.1
(C)	$x + \{z\} =$	(R)	1
(D)	$z + [y] - \{x\} =$	(S)	3
		(T)	4

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2. Consider $ax^4 + (7a - 2b)x^3 + (12a - 14b - c)x^2 - (2ab + 7c)x + 1 - 12c = 0,$ has no real roots and

$$f_1(x) = \frac{\sqrt{\log_{(\pi+e)}(ax^4 + (7a - 2b)x^3 + (12a - 14b - c)x^2 - (24b + 7c)}}{\sqrt{a}\sqrt{-sgn(1 + ac + b^2)}}$$

$$f_2(x) = -2 + 2\log_{\sqrt{2}} \cos\left(\tan^{-1}\left(\sin\left(\pi\left(\cos\left(\pi\left(x + \frac{7}{2}\right)\right)\right)\right)\right)\right).$$

Then match the following :

	Column-I		Column-II
(A)	Domain of $f_1(x)$ is	(P)	$[-3, -2]$
(B)	Range of $f_2(x)$ in the domain of $f_1(x)$ is	(Q)	$[-4, -2]$
(C)	Range of $f_2(x)$ is	(R)	$(-\infty, \infty)$
(D)	Domain of $f_2(x)$ is	(S)	$(-\infty, -4] \cup [-3, \infty)$
		(T)	$[0, 1]$

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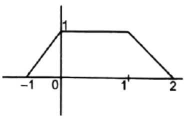
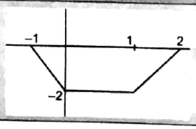
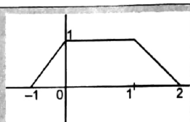
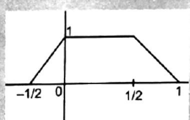
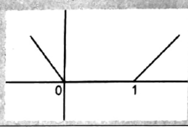
3. Given the graph of $y = f(x)$



	Column-I		Column-II
(A)	$y = f(1-x)$	(P)	
(B)	$y = f(2x)$	(Q)	
(C)	$y = -2f(x)$	(R)	
(D)	$y = 1 - f(x)$	(S)	

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4.

	Column-I		Column-II
(A)	$f(x) = \sin^2 2x - 2\sin^2 x$	(P)	Range contains no natural number
(B)	$f(x) = \frac{4}{\pi}(\sin^{-1}(\sin \pi x))$	(Q)	Range contains atleast one integer
(C)	$f(x) = \sqrt{\ln(\cos(\sin x))}$	(R)	Many one but not even function
(D)	$f(x) = \tan^{-1}\left(\frac{x^2+1}{x^2+\sqrt{3}}\right)$	(S)	Both many one and even function
		(T)	Periodic but not odd function

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5.

	Column-I		Column-II
(A)	If $\lvert x^2 - x\rvert \geq x^2 + x$, then complete set of values of x is	(P)	$(0, \infty)$
(B)	If $\lvert x+y\rvert > x-y$, where $x > 0$, then complete set of values of y is	(Q)	$(-\infty, 0]$
(C)	If $\log_2 x \geq \log_2(x^2)$, then complete set of values of x is	(R)	$[-1, \infty)$
(D)	$[x] + 2 \geq \lvert x\rvert$, (where $[\cdot]$ denotes the greatest integer function) then complete set of values of x is	(S)	$(0, 1]$
		(T)	$[1, \infty)$

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6.

	Column-I		Column-II
(A)	Domain of $f(x) = \ln \tan^{-1}\{(x^3 - 6x^2 + 11x - 6)x(e^x - 1)\}$ is	(P)	$\left[-1, \frac{5}{4}\right]$
(B)	Range of $f(x) = \sin^2\frac{x}{4} + \cos\frac{x}{4}$ is	(Q)	$[2, \infty)$
(C)	The domain of function $f(x) = \sqrt{\log_{(\lvert x\rvert-1)}(x^2+4x+4)}$ is	(R)	$(1, 2) \cup (3, \infty)$
(D)	Let $f(x) = \begin{cases} x^2 & x < 1 \\ x+1 & x \geq 1 \end{cases}; g(x) = \begin{cases} x+2 & x < 1 \\ x^2 & x \geq 1 \end{cases}$	(S)	$[0, \infty)$
	Then range of function $f(g(x))$ is	(T)	$(-\infty, -3) \cup (-2, -1) \cup (2, \infty)$

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7. Let $f(x) = \begin{cases} 1 + x, & 0 \leq x \leq 2 \\ 3 - x, & 2 < x \leq 3 \end{cases}$

find (fof) (x).

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Subjective Type Problems

1. Let $f(x)$ be a polynomial of degree 6 with leading coefficient 2009. Suppose further that f(1) =1, f(2)=3, f(3)=5, f(4)=7, f(5) =9, f'(2)=2. Then the sum of all the digits of f(6) is

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2. Let $f(x) = x^3 - 3x$ Find $f(f(x))$

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3. If $f(x+y+1) = \left\{\sqrt{f(x)} + \sqrt{f(y)}\right\}^2$ and $f(0) = 1 \forall x, y \in R, determ \in ef(n), n \in N$.

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4. If the domain of $f(x) = \sqrt{12 - 3^x - 3^{3-x}} + \sin^{-1}\left(\frac{2x}{3}\right) is[a, b]$, then $a = \ldots\ldots$

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5. The number of elements in the range of functions: $y = \sin^{-1}\left[x^2 + \frac{5}{9}\right] + \cos^{-1}\left[x^2 - \frac{4}{9}\right]$ where where [.] denotes the greatest integer function is:

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6. The number of integers in the range of function $f(x) = [\sin x] + [\cos x] + [\sin x + \cos x]$ is (where $[.]$= denotes greatest integer function)

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7. If $P(x)$ is polynomial of degree 4 such than $P(-1) = P(1) = 5$ and $P(-2) = P(0) = P(2) = 2$ find the maximum vaue of P (x).

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8. The number of integral vlaue (s) of k for which the curve $y = \sqrt{-x^2 - 2x}$ and $x + y - k = 0$ intersect at 2 distinct points is/are

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9. Let the solution set of the equation $\sqrt{\left[x+\left[\frac{x}{2}\right]\right]}+\left[\sqrt{\{x\}}+\left[\frac{x}{3}\right]\right]=3$ is $[a, b)$. Find the product ab. (where $[\cdot]$ and $\{\cdot\}$ denote greatest integer and fractional part function, respectively).

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10. For the real number x, let $f(x)=\frac{1}{2011\sqrt{1-x^{2011}}}$. Find the number of real roots of the equation

$f(f(\ldots..(f(x))\ldots..)=(\{-x\}$

where f is applies 2013 times and {.} denotes fractional part function.

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11. Find the number of elements contained in the range of the function $f(x)=\left[\frac{x}{6}\right]\left[\frac{-6}{x}\right]\forall x\in$ (0,30)]$where[.]`$ denotes greatest integer function)

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12. Let $f(x,y)=x^2-y^2$ and $g(x,y)=2xy.$ such that $(f(x,y))^2-(g(x,y))^2=\frac{1}{2}$ and $f(x,y).\,G(x,y)=\frac{\sqrt{3}}{4}$ Find the number of ordered pairs (x,y) ?

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13. Let $f(x)=\frac{x+5}{\sqrt{x^2+1}}\forall x\in R,$ then the smallest integral value of k for which $f(x)\leq k\forall x\in R$is

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14. The number of integral vaues of which $f: R \to R,\ f(x) = \frac{x^2}{3} + (m-1)x^2 + (m+5)x + n$ is bijective is :

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15. The number of roots of equation $\frac{(x-1)(x-3)}{(x-2)(x-4)} - e^x\Big)\frac{(x+1)(x+3)e^x}{(x+2)(x+4)} - 1\Big)\left(x^3 - \cos x\right) = 0$:

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16. Let $f(x) = x^2 - bx + c$, b is an odd positive integer. Given that f(x)=0 has two prime numbers as roots and b+c=35. If the least value of $f(x)\,\forall x \in R$ is λ, then $\left[\left|\frac{\lambda}{3}\right|\right]$ is equal to (where [.] denotes greatest integer function)

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17. Let $f(x)$ be a continuous function such that $f(0) = 1$ and $f(x) = f\left(\frac{x}{7}\right) = \frac{x}{7} \forall x \in R,$ then $f(42)$ is

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18. If $f(x) = 4x^3 - x^2 - 2x + 1$ and $g(x) = \begin{cases} \min\{f(t) : 0 \leq t \leq x\} & 0 \leq \\ 3 - x & 1 < \end{cases}$ and if $\lambda = g\left(\frac{1}{4}\right) + g\left(\frac{3}{4}\right) + g\left(\frac{5}{4}\right),$ then $2\lambda =$

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19. If $x = 10\sum_{r=3}^{100} \frac{1}{(r^2 - 4)}$, then $[x] =$

(where [.] denotes gratest integer function)

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20. Let $fx = \frac{ax+b}{xa+d}$, where a,b,c d are non zero If $f(7) = 7, f(11) = 11$ and $f(f(x)) = x$ for all x expect $-\frac{d}{c}$. The unique number which is not is the range of f is

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21. Let $A = \{x \mid x^2 - 4x + 3 < 0, x \in R\}$

If $A \subset B$, then the rang of real number $p \in [a, b]$ where, a,b are integers. Find the value of $(b - a)$.

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22. Let the maximum value of expression $y = \frac{x^4 - x^2}{x^6 + 2x^3 - 1}$ for $x > 1 is \frac{p}{1}$, where p and 1q are relatively prime natural numbers, then $p + q =$

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23. If f(x) is an even function then find the number of distinct real numbers x such that $f(x) = f\left(\frac{x+1}{x+2}\right)$.

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24. The least integral value of m, m $\in R$ for which the range of function $f(x) = \frac{x+m}{x^2+1}$ contains the interval $[0, 1]$ is :

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25. Let x_1, x_2, x_3 satisfying the equation $x^3 - x^2 + \beta x + \gamma = 0$ are in GP where $(x_1, x_2, x_3 > 0)$, then the maximum value of $[\beta] + [\gamma] + 2$ is, [.] is greatest integer function.

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26. If $\sum_{r=1}^{n} [\log_2 r] = 2010$ where [.] denotes greatest integer function, then the sum of the digits of n is:

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27. Let $fx = \frac{ax+b}{xa+d}$, where a,b,c d are non zero If $f(7) = 7, f(11) = 11$ and $f(f(x)) = x$ for all x expect $-\frac{d}{c}$. The unique number which is not is the range of f is

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28. It is pouring down rain and the amount of rain hitting point (x, y) is given by $f(x, y) = \left|x^3 + 2x^2y - 5xy^2 - 6y^3\right|$. If Mr. 'A' starts at $(0, 0)$, find number of possible value (s) for 'm' such that y= mx is a line along which Mr.' A could walk without any rain falling on him.

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29. Let P (x) be a cubic polynomical with leading co-efficient unity. Let the remainder when P (x) is divided by $x^2 - 5x + 6$ equals 2 times the remainder when P (x) is divided by $x^2 - 5x + 4$. If $P(0) = 100$, find thesum of the digits of $P(5)$,

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30. Let $f(x) = x^2 + 10x + 20$. Find the number of real solution of the equation $f(f(f(f(x)))) = 0$

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31. If range of $f(x) = \frac{(\ln x)(\ln x^2) + \ln x^3 + 3}{\ln^2 x + \ln x^2 + 2}$ can be expressed as $\left[\frac{a}{b}, \frac{c}{d}\right]$ where a,b,c and d are prime numbers (not nacessarily distinct) then find the value of $\frac{(a + b + c + d)}{2}$.

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32. Polynomial $P(x)$ contains only terms of aodd degree. when $P(x)$ is divided by $(x-3)$, the ramainder is 6. If $P(x)$ is divided by $\left(x^2-9\right)$ then remainder is $g(x)$. Then find the value of $g(2)$.

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33. The equation $2x^3-3x^2+p=0$ has three real roots. Then find the minimum value of p.

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34. Find the number of integers in the domain of $f(x)=\dfrac{1}{\sqrt{\ln\cos^{-1}x}}$

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