Sample Task **Questions**

Questions with Answer Keys **MathonGo**

Q1

The domain of definition of the function $f(x)=\sqrt{\log_{(|x|-1)}\left(x^2+4x+4\right)}$, is

(1) $[-3,\ -1]\cup[1,\ 2]$

(2) $(-2,\ -1)\cup[2,\ \infty)$

(3) $(-\infty,\ -3]\cup(-2,\ -1)\cup(2,\ \infty)$

(4) $[-2,\ -1]\cup[2,\ \infty)$

Q2

If domain of $f(x)$ is $[1, 3]$, then find the domain of $f\left(\log_2\left(x^2+3x-2\right)\right)$

(1) $[-5,\ -4]\cup[1, 2]$

(2) $\left[-13,\ -2\right]\cup\left[\frac{3}{2}, 5\right]$

(3) $[-4, 1]\cup[2, 7]$

(4) $[-3, 2]$

Q3

If $f(x)=\tan^{-1}\sqrt{x^2+4x}+\sin^{-1}\sqrt{x^2+4x+1}$, then

(1) domain of $f(x)$ contains 3 integers only

(2) range of $f(x)$ has two elements only

(3) $f(x)$ is a constant function $\forall x\in R$

(4) $f(x)$ contains only two elements in its domain

Q4

If $f(x) = \dfrac{x^2 - \left[x^2\right]}{1 + x^2 - \left[x^2\right]}$ (where [.] represents the greatest integer part of x), then the range of $f(x)$ is

(1) $[0,1)$

(2) $(-1,1)$

(3) $(0, \infty)$

(4) $\left[0, \frac{1}{2}\right)$

Q5

If $f\left(x\right) = \sin^4 x + \cos^4 x - \frac{1}{2}\sin 2x$ then the range of $f(x)$ is

(1) $\left[0, \frac{3}{2}\right]$

(2) $\left[-\frac{1}{2}, \frac{7}{2}\right]$

(3) $\left[0, \frac{9}{8}\right]$

(4) $\left[\frac{3}{4}, \frac{7}{8}\right]$

Q6

Domain and range of the function $f\left(x\right) = \sqrt{\sin^{-1}\left(3x\right) + \frac{\pi}{3}}$ is $\left[\frac{a}{\sqrt{3}}, \frac{b}{3}\right]$ and $\left[c, d\sqrt{5\pi}\right]$ respectively, then $2a + b + c + 6d$ is equal to

(1) 1

(2) $2\sqrt{3}$

(3) $\sqrt{6}$

(4) none of these

Q7

The number of integral value(s) of x which satisfying the equation $\left|\log_4\left(2x^2 - x\right) + \log_2\left(2 - x^2\right) + x^2 + 2x + 2\right|$

$= x^2 + 2x + 2 + \left|\log_4\left(2x^2 - x\right)\right| + \left|\log_2\left(2 - x^2\right)\right|$

(1) 0

(2) 1

(3) 2

(4) 4

Q8

$[x]$ and $\{x\}$ represent the greatest integer function and fractional part function respectively. Let

$f\left(x\right) = \left[x\right] + \sum_{i=1}^{2020} \frac{\{x+r\}}{2020}$. Find the value of $f(-1000)$

Q9

The function $f(x) = \sec\left[\log\left(x + \sqrt{1 + x^2}\right)\right]$ is

(1) an odd function

(2) an even function

(3) neither an odd nor an even function

(4) a constant function

Q10

Which of the following is a function whose graph is symmetrical about the origin?

(1) $f(x) = \left(2^x + 2^{-x}\right)$

(2) $f(x) = \left[\log\left(x + \sqrt{1 + x^2}\right)\right]^2$

(3) $f(x + y) = f(x) + f(y)\ \forall x, y \in R$

(4) None of these

Q11

If the graph of the function $f(x) = ax^3 + x^2 + bx + c$ is symmetric about the line $x = 2$, then the value of $a + b$ is equal to

(1) 10

(2) -4

(3) 16

(4) -10

Q12

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

(1) π

(2) $\pi/2$

(3) 2π

(4) None of these

Q13

A function f is defined as $f(x) = \frac{1}{2}\left(\frac{|\sin x|}{\cos x} + \frac{\sin x}{|\cos x|}\right)$. If the fundamental period of function f is $m\pi$, then the value of m is

Q14

If $f: R \rightarrow A$ defined as $f(x) = \tan^{-1}\left(\sqrt{4\left(x^2 + x + 1\right)}\right)$ is surjective, then A is equal to

(1) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

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

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

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

Q15

Which of the following function is surjective but not injective?

(1) $f: R \rightarrow R,\ f(x) = x^4 + 2x^3 - x^2 + 1$

(2) $f: R \rightarrow R,\ f(x) = x^3 + x + 1$

(3) $f: R \rightarrow R^+,\ f(x) = \sqrt{1 + x^2}$

(4) $f: R \rightarrow R,\ f(x) = x^3 + 2x^2 - x + 1$

Q16

If $f: R \rightarrow R$ be defined as $f(x) = \frac{e^{2x} - e^{-2x}}{2}$, then

(1) f is many-one

(2) f is into

(3) $f^{-1}(x) = \frac{1}{2}\left[\log\left(x - \sqrt{x^2+1}\right)\right]$

(4) $f^{-1}(x) = \frac{1}{2}\left[\log\left(x + \sqrt{x^2+1}\right)\right]$

Q17

If $f: R \rightarrow R$ be a function such that $f(x) = x^3 + x^2 + 4x + \sin x$. Then, the function $f(x)$ is

(1) one-one and onto

(2) one-one and into

(3) many-one and onto

(4) many-one and into

Q18

Let $f: R \rightarrow R$ be a function defined by

$$f(x) = \begin{cases} x + \frac{1}{x}, & x > 0 \\ e^x, & x \leq 0 \end{cases} \text{ then } f \text{ is}$$

(1) both one-one onto

(2) one-one but not onto

(3) onto but not one-one

(4) neither one-one nor onto

Q19

A function $f\colon Z \to Z$ is defined as $f(n) = \begin{cases} n+1 & n \in \text{odd integer} \\ \frac{n}{2} & n \in \text{even integer} \end{cases}$. If $k \in$ odd integer and $f(f(f(k))) = 33,$ then the sum of the digits of k is

(1) 7

(2) 5

(3) 9

(4) 8

Q20

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

(1) 1

(2) 2

(3) 3

(4) None of these

Q21

Given two real sets $A = \left\{a, a_2, a_3 \cdots a_{2n}\right\}$ and $B\left\{b_1, b_2, \cdots b_n\right\}$. If $f\colon A \to B$ is a function such that every element of B has an inverse image and $f\left(a_1\right) \leq f\left(a_2\right) \leq f\left(a_3\right) \leq f\left(a_4\right) \cdots \leq f\left(a_{2n}\right),$ then the number of such mappings are

(1) ${}^{2n}C_n$

(2) ${}^{2n}C_{n-1}$

(3) ${}^{2n-1}C_{n-1}$

(4) ${}^{2n+1}C_n$

Q22

Let $A = \{0, 1, 2, 3, 4, 5, 6, 7\}$. Then the number of bijective functions $f: A \rightarrow A$ such that $f(1) + f(2) = 3 - f(3)$ is equal to

Q23

If $f: R \rightarrow R, f(x) = \frac{\sin([x]\pi)}{x^2+2x+3} + 2x - 1 + \sqrt{x(x-1) + \frac{1}{4}}$ (where $[x]$ denotes greatest integral value less than or equal to x) denotes a function, then number of real solutions of equation $f(x) = f^{-1}(x)$ is

(1) 0

(2) 1

(3) 2

(4) 3

Q24

Equation $|x - 4| + |x + 4| = ax + 8$ has

(1) no solution if $a \in (-\infty, -2] \cup [2, \infty)$.

(2) exactly one solution if $a \in (-2, 2)$.

(3) exactly two solutions if $a \in (-2, 0) \cup (0, 2)$.

(4) exactly two solutions if $a = 0$$

Q25

The total number of solution(s) of the equation $2x + 3\tan x = \frac{5\pi}{2}$ in $x \in [0, 2\pi]$ is/are equal to

(1) 1

(2) 2

(3) 3

(4) 4

Q26

If $2f(xy) = (f(x))^y + (f(y))^x$ for all $x, y \in R$ and $f(1) = 3$, then the value of $\sum_{r=1}^{10} f(r)$ is equal to

(1) $\frac{3}{2}\left(3^{10} - 1\right)$

(2) $\frac{3}{2}\left(3^{9} - 1\right)$

(3) $\frac{3^{10} - 1}{2}$

(4) $\frac{1}{2}\left(3^{10} - 1\right)$

Q27

Let f be a function such that $f(x) + f\left(\frac{1}{1-x}\right) = \frac{2(1-2x)}{x(1-x)}$ where $x \in R - \{0, 1\}$, then the value of $f(2)$ must be

Q28

Let $f(x)$ be a function defined as $f: R \rightarrow R$ such that $f(x+2) + f(x-2) = f(x)$ and $f(1) = 3$ then the value of the expression $\sum_{r=0}^{15} f(1 + 12r)$ is equal to

Q29

If $f(x+y) = f(x) + f(y) - xy - 1$, $\forall\ x, y \in R$ and $f(1) = 1$, then the number of solutions of $f(n) = n$, $n \in N$, is

(1) one

(2) two

(3) no solution

(4) three

Q30

If $f(x)$ is a real valued function such that $f(x+6) - f(x+3) + f(x) = 0,\ \forall x \in R$, then period of $f(x)$ is

(1) 6

(2) 12

(3) 18

(4) 24

Answer Key

Q1 (3)	**Q2** (1)	**Q3** (4)	**Q4** (4)
Q5 (3)	**Q6** (3)	**Q7** (3)	**Q8** (10.5)
Q9 (2)	**Q10** (3)	**Q11** (2)	**Q12** (2)
Q13 (2)	**Q14** (3)	**Q15** (4)	**Q16** (4)
Q17 (1)	**Q18** (4)	**Q19** (2)	**Q20** (3)
Q21 (3)	**Q22** (720)	**Q23** (2)	**Q24** (3)
Q25 (3)	**Q26** (1)	**Q27** (3)	**Q28** (48.00)
Q29 (1)	**Q30** (3)		