

## Sample Task

## Questions

## Questions with Answer Keys

## MathonGo

Q1

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{\left[1 - \tan\left(\frac{x}{2}\right)\right] [1 - \sin x]}{\left[1 + \tan\left(\frac{x}{2}\right)\right] [\pi - 2x]^3}$$
 is equal to

(1)  $\frac{1}{8}$

(2) 0

(3)  $\frac{1}{32}$

(4)  $\infty$

Q2

$$\text{The value of } \lim_{x \rightarrow 0} \frac{1 - \cos^3(\sin x)}{\sin x \sin(\sin x) \cos(\sin x)}$$
 is equal to

(1)  $\frac{3}{2}$

(2) 1

(3) 0

(4) 2

Q3

$$\text{The value of } \lim_{x \rightarrow -\infty} \frac{x^2 \tan\left(\frac{1}{x}\right)}{\sqrt{4x^2 - x} + 1}$$
 is equal to

(1) 1

(2)  $\frac{1}{2}$

(3) -1

(4)  $-\frac{1}{2}$

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Q4

$$\lim_{x \rightarrow 0} \frac{\tan x \sqrt{\tan x} - \sin x \sqrt{\sin x}}{x^3 \sqrt{x}} \text{ equals}$$

(1)  $\frac{1}{4}$

(2)  $\frac{3}{4}$

(3)  $\frac{1}{2}$

(4) 1

Q5

$$\lim_{x \rightarrow 0} \frac{(1 - \cos x)(3 + \cos 2x)}{x \cdot \tan 2x} =$$

(1) 0

(2) 1

(3)  $\frac{1}{2}$

(4) -1

Q6

$$\text{The value of } \lim_{x \rightarrow 0} \frac{1 - \cos^3 x}{x \sin x \cos x} \text{ is}$$

(1)  $\frac{2}{5}$

(2)  $\frac{3}{5}$

(3)  $\frac{3}{2}$

(4)  $\frac{3}{4}$

Q7

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If  $\lim_{x \rightarrow 0} (x^{-3} \sin 3x + ax^{-2} + b)$  exists and is equal to 0, then

(1)  $a = -3$  and  $b = 9/2$

(2)  $a = 3$  and  $b = 9/2$

(3)  $a = -3$  and  $b = -9/2$

(4)  $a = 3$  and  $b = -9/2$

## Q8

If  $f(x)$  is a differentiable function such that  $f'(1) = 4$  and  $f'(4) = \frac{1}{2}$ , then value of  $\lim_{x \rightarrow 0} \frac{f(x^2+x+1) - f(1)}{f(x^4-x^2+2x+4) - f(4)}$  is :-

(1) 8

(2) 16

(3) 4

(4) Does not exist

## Q9

If  $\lim_{x \rightarrow \infty} \left( \sqrt{x^2 + x + 2} - ax - b \right) = 2$ , then equation of circle whose centre is  $(a, 2b)$  and radius 1 unit is

(1)  $x^2 + y^2 + 2x + 6y + 9 = 0$

(2)  $x^2 + y^2 - 2x + 6y + 1 = 0$

(3)  $x^2 + y^2 - 2x + 6y + 9 = 0$

(4) none of these

## Q10

For a positive integer  $m$ , if  $\lim_{x \rightarrow \infty} \left( x^3 \ln \left( \frac{x+1}{x} \right) + \frac{x}{2} - x^2 \right) = \frac{1}{m}$ . Then the value of  $m$  is

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(1) 1

(2) 2

(3) 3

(4) 4

## Q11

The value of  $\lim_{n \rightarrow \infty} \frac{3.2^{n+1} - 4.5^{n+1}}{5.2^n + 7.5^n}$  is equal to

(1)  $\frac{3}{5}$ (2)  $-\frac{4}{7}$ (3)  $-\frac{20}{7}$ 

(4) 0

## Q12

The value of  $\lim_{x \rightarrow 0} \frac{\ln(2 - \cos 15x)}{\ln^2(\sin 3x + 1)}$  is equal to

## Q13

Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a function defined as  $f(x) = a \sin\left(\frac{\pi[x]}{2}\right) + [2 - x]$ ,  $a \in \mathbb{R}$ , where  $[t]$  is the greatest integer less than or equal to  $t$ . If  $\lim_{x \rightarrow -1} f(x)$  exists, then the value of  $\int_0^4 f(x) dx$  is equal to

(1) -1

(2) -2

(3) 1

(4) 2



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Q14

The integer  $n$  for which  $\lim_{x \rightarrow 0} \frac{(\cos x - 1)(\cos x - e^x)}{x^n}$  is a finite nonzero number is

(1) 1

(2) 2

(3) 3

(4) 4

Q15

If the largest value of the  $\lim_{x \rightarrow \infty} \left(1 + \frac{a}{x}\right)^{\frac{x}{b}}$  where  $a, b$  lies in the interval  $\left[\frac{1}{5}, 403\right]$  is  $e^\lambda$ , then  $\lambda$  equals

(1) 2015

(2) 2016

(3) 2017

(4) 2018

Q16

$\lim_{n \rightarrow \infty} \left(\frac{2n^2 - 3}{2n^2 - n + 1}\right)^{\frac{n^2 - 1}{n}}$  is equal to

(1)  $\frac{1}{\sqrt{e}}$ (2)  $\sqrt{e}$ (3)  $e$ (4)  $\frac{1}{e}$ 

Q17

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$$\lim_{x \rightarrow 2} \frac{3^x + 3^{3-x} - 12}{3^{-\frac{x}{2}} - 3^{1-x}}$$
 is equal to

Q18

The value of  $\lim_{x \rightarrow 0} \left( \frac{1 + \tan x}{1 + \sin x} \right)^{\frac{2}{\sin x}}$  is equal to

- (1) 0
- (2) 1
- (3) -1
- (4) None of these

Q19

The value of  $\lim_{x \rightarrow 0^+} ((x \cot x) + (x \ln x))$  is equal to

- (1) 1
- (2) 2
- (3) 3
- (4) 0

Q20

The value of  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\left[ \frac{x}{3} \right]}{\ln(\sin x)}$  (where,  $[.]$  denotes the greatest integer function)

- (1) does not exist
- (2) is equal to 1
- (3) is equal to 0

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(4) is equal to -1

Q21

The  $\lim_{x \rightarrow 0} x^8 \left[ \frac{1}{x^3} \right]$  (where  $[x]$  is greatest integer function) is (Mark incorrect option)

- (1) a nonzero real number
- (2) a rational number
- (3) an integer
- (4) zero

Q22

If  $\lim_{x \rightarrow 0} \frac{\sin 2x - a \sin x}{x^3}$  exists finitely, then the value of  $a$  is

- (1) 0
- (2) 2
- (3) 1
- (4) 4

Q23

The value of  $\lim_{x \rightarrow 0} \frac{\sin x}{3} \left[ \frac{5}{x} \right]$  is equal to

(where,  $[.]$  represents the greatest integer function)

- (1)  $\frac{1}{3}$
- (2) 0

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(3)  $\frac{5}{3}$

(4) 1

Q24

The value of the limit

$$\lim_{n \rightarrow \infty} n^2 \left\{ \sqrt{\left(1 - \cos \frac{1}{n}\right)} \sqrt{\left(1 - \cos \frac{1}{n}\right)} \sqrt{\left(1 - \cos \frac{1}{n}\right)} \dots \infty \right\} \text{ is}$$

(1)  $\frac{1}{2}$

(2) -2

(3) 2

(4)  $-\frac{1}{2}$

Q25

The value of  $\lim_{n \rightarrow \infty} \frac{[x] + [2^2x] + [3^2x] + \dots + [n^2x]}{1^2 + 2^2 + 3^2 + \dots + n^2}$  is equal to (where  $[x]$  represents the greatest integer part of  $x$ )

(1)  $x$

(2)  $2x$

(3)  $\frac{x}{2}$

(4)  $\frac{x}{6}$

Q26



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Let  $\alpha, \beta \in \mathbb{R}$  be such that  $\lim_{x \rightarrow 0} \frac{x^2 \tan(ax)}{\beta x - \tan(2x)} = 1$ , then the value of  $5\beta + 3\alpha$  is :

Q27

$\lim_{x \rightarrow 0} \frac{\cos(\sin x) - \cos x}{x^4}$  is equal to

- (1)  $\frac{1}{3}$
- (2)  $\frac{1}{6}$
- (3)  $\frac{1}{4}$
- (4)  $\frac{1}{12}$

Q28

The value of  $\lim_{n \rightarrow \infty} \frac{[r] + [2r] + \dots + [nr]}{n^2}$ , where  $r$  is non-zero real number and  $[r]$  denotes the greatest integer less than or equal to  $r$ , is equal to :

- (1)  $\frac{r}{2}$
- (2)  $r$
- (3)  $2r$
- (4)  $0$

Q29

The value of  $\lim_{x \rightarrow 0} \frac{e^{-\frac{x^2}{2}} - \cos x}{x^3 \tan x}$  is equal to

- (1)  $\frac{1}{4}$
- (2)  $\frac{1}{8}$
- (3)  $\frac{1}{12}$

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(4)  $\frac{1}{16}$

Q30

If  $\lim_{x \rightarrow \infty} \frac{ae^x + b\cos x + c + dx}{x\sin^2 x} = 3$ , then the value of  $272\frac{abd}{c^3}$  is equal to

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Q1 (3)	Q2 (1)	Q3 (4)	Q4 (2)
Q5 (2)	Q6 (3)	Q7 (1)	Q8 (3)
Q9 (3)	Q10 (3)	Q11 (3)	Q12 (12.5)
Q13 (2)	Q14 (3)	Q15 (1)	Q16 (2)
Q17 (36)	Q18 (2)	Q19 (1)	Q20 (3)
Q21 (1)	Q22 (2)	Q23 (3)	Q24 (1)
Q25 (1)	Q26 (2.00)	Q27 (2)	Q28 (1)
Q29 (3)	Q30 (34)		