

EXERCISE - O

SINGLE CORRECT TYPE QUESTIONS

1. If $\lim_{x \rightarrow a} \frac{2x - \sqrt{x^2 + 3a^2}}{\sqrt{x+a} - \sqrt{2a}} = \sqrt{2}$ (where $a \in \mathbb{R}^+$), then a is equal to -
 (A) $\frac{1}{3}$ (B) $\frac{1}{2\sqrt{2}}$ (C) $\frac{1}{3\sqrt{2}}$ (D) $\frac{1}{9}$ MLT001
2. If $\lim_{n \rightarrow \infty} (\sqrt{2n^2 + n} - \lambda \sqrt{2n^2 - n}) = \frac{1}{\sqrt{2}}$ (where λ is a real number), then-
 (A) $\lambda = 1$ (B) $\lambda = -1$ (C) $\lambda = \pm 1$ (D) $\lambda \in (-\infty, 1)$ MLT005
3. For $n \in \mathbb{N}$, let $a_n = \sum_{k=1}^n 2k$ and $b_n = \sum_{k=1}^n (2k - 1)$. Then $\lim_{n \rightarrow \infty} (\sqrt{a_n} - \sqrt{b_n})$ is equal to-
 (A) 1 (B) $\frac{1}{2}$ (C) 0 (D) 2 MLT007
4. $\lim_{x \rightarrow -1} \frac{\cos 2 - \cos 2x}{x^2 - |x|}$ is equal to
 (A) 0 (B) $\cos 2$ (C) $2 \sin 2$ (D) $\sin 1$ MLT008
5. $\lim_{x \rightarrow 0} \frac{|\cos(\sin(3x))| - 1}{x^2}$ equals
 (A) $-\frac{9}{2}$ (B) $-\frac{3}{2}$ (C) $\frac{3}{2}$ (D) $\frac{9}{2}$ MLT010
6. Let $a = \min\{x^2 + 2x + 3, x \in \mathbb{R}\}$ and $b = \lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta^2}$. Then value of $\sum_{r=0}^n a^r \cdot b^{n-r}$ is :
 (A) $\frac{2^{n+1} - 1}{3 \cdot 2^n}$ (B) $\frac{2^{n+1} + 1}{3 \cdot 2^n}$ (C) $\frac{4^{n+1} - 1}{3 \cdot 2^n}$ (D) N.O.T. MLT011
7. $\lim_{x \rightarrow 0} (\cos x + a \sin bx)^{\frac{1}{x}}$ is equal to
 (A) e^a (B) e^{ab} (C) e^b (D) $e^{a/b}$ MLT014
8. $\lim_{x \rightarrow \infty} \left(\frac{1^{1/x} + 2^{1/x} + 3^{1/x} + \dots + n^{1/x}}{n} \right)^{nx}$, $n \in \mathbb{N}$ is equal to
 (A) $n!$ (B) 1 (C) $\frac{1}{n!}$ (D) 0 MLT015

9. If $\lim_{x \rightarrow \lambda} \left(2 - \frac{\lambda}{x}\right)^{\lambda \tan\left(\frac{\pi x}{2\lambda}\right)} = \frac{1}{e}$, then λ is equal to -
 (A) $-\pi$ (B) π (C) $\frac{\pi}{2}$ (D) $-\frac{2}{\pi}$ MLT016
10. Let $f(x) = \frac{\tan x}{x}$, then the value of $\lim_{x \rightarrow 0} \left(\left[f(x) \right] + x^2\right)^{\frac{1}{\{f(x)\}}}$ is equal to (where $[.]$, $\{.\}$ denotes greatest integer function and fractional part functions respectively) -
 (A) e^{-3} (B) e^3 (C) e^2 (D) non-existent MLT018
11. $\lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x^3} = 1$ then
 (A) $a = -5/2$ (B) $a = -3/2, b = -1/2$
 (C) $a = -3/2, b = -5/2$ (D) $a = -5/2, b = -3/2$ MLT020

MULTIPLE CORRECT TYPE QUESTIONS

12. Let $f(x) = \begin{cases} \sin x; \text{ where } x = \text{integer} \\ 0; \text{ otherwise} \end{cases}$; $g(x) = \begin{cases} x^2 + 1; & x \neq 0, 2 \\ 4; & x = 0 \\ 5; & x = 2 \end{cases}$, then
 (A) $\lim_{x \rightarrow 0} g(f(x)) = 4$ (B) $\lim_{x \rightarrow 0} f(g(x)) = 0$
 (C) $\lim_{x \rightarrow 1} f(g(x)) = 0$ (D) $\lim_{x \rightarrow 1} g(f(x)) = 5$ MLT055
13. If $A = \lim_{x \rightarrow 0} \frac{\sin^{-1}(\sin x)}{\cos^{-1}(\cos x)}$ and $B = \lim_{x \rightarrow 0} \frac{[x]}{x}$, then (where $[.]$ denotes greatest integer function)-
 (A) $A = 1$ (B) A does not exist
 (C) $B = 0$ (D) $B = 1$ MLT058
14. The value(s) of 'n' for which $\lim_{x \rightarrow 1} \frac{e^{x-1} - x}{(x-1)^n}$ exists is/are -
 (A) 1 (B) 2 (C) 3 (D) 4 MLT060
15. $\lim_{x \rightarrow c} f(x)$ does not exist when $LHL \neq RHL$ (where $[x]$ is the step-up function, $\{x\}$ is the fractional part function of x & $\text{sgn}(x)$ denotes signum function), then-
 (A) $f(x) = [x] - [2x - 1]; c = 3$ (B) $f(x) = [x] - x, c = 1$
 (C) $f(x) = \{x\}^2 - \{-x\}^2, c = 0$ (D) $f(x) = \frac{\tan(\text{sgn } x)}{\text{sgn } x}, c = 0$ MLT062

COMPREHENSION TYPE QUESTIONS

Paragraph for Question No. 16 to 18

Consider two functions $f(x) = \lim_{n \rightarrow \infty} \left(\cos \frac{x}{\sqrt{n}} \right)^n$ and $g(x) = -x^{4b}$,

Where $b = \lim_{x \rightarrow \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1} \right)$, then

16. $f(x)$ is

- (A) e^{-x^2} (B) $e^{\frac{-x^2}{2}}$ (C) e^{x^2} (D) $e^{\frac{x^2}{2}}$

MLT064

17. $g(x)$ is

- (A) $-x^2$ (B) x^2 (C) x^4 (D) $-x^4$

MLT065

18. Number of solutions of equation $f(x) + g(x) = 0$ is

- (A) 2 (B) 4 (C) 0 (D) 1

MLT066

Paragraph for Question No. 19 to 21

Consider $f(x) = \frac{\sin x + ae^x + be^{-x} + c \ln(1+x)}{x^3}$, where a, b, c are real numbers.

19. If $\lim_{x \rightarrow 0^+} f(x)$ is finite, then the value of $a - b + c$ is

MLT067

20. If $\lim_{x \rightarrow 0^+} f(x) = \ell$ (finite), then the value of ℓ is

MLT068

21. Using the values of a, b, c as found above, the value of $\lim_{x \rightarrow 0^+} x f(x)$ is

MLT069

MATCHING LIST TYPE QUESTION

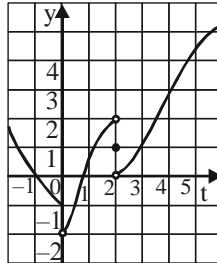
22. $\lim_{x \rightarrow 0} f(x)$, where $f(x)$ is as in LIST-I, is

List-I		List-II	
(P)	$f(x) = \frac{\tan[e^2]x^2 - \tan[-e^2]x^2}{\sin^2 x}$ where [.] represents greatest integer function.	(1)	$\frac{\sqrt{2}}{8}$
(Q)	$f(x) = \left[(\min(t^2 + 4t + 6)) \frac{\sin x}{x} \right]$ where [.] represents greatest integer function.	(2)	15
(R)	$f(x) = \frac{\sqrt[3]{1+x^2} - \sqrt[4]{1-2x}}{x+x^2}$	(3)	1
(S)	$f(x) = \frac{\sqrt{2} - \sqrt{1+\cos x}}{\sin^2 x}$	(4)	$\frac{1}{2}$

- (A) (P) → (3), (Q) → (2), (R) → (4), (S) → (1)
- (B) (P) → (2), (Q) → (3), (R) → (4), (S) → (1)
- (C) (P) → (2), (Q) → (3), (R) → (1), (S) → (4)
- (D) (P) → (2), (Q) → (4), (R) → (3), (S) → (1)

MLT070

23. For the function $g(t)$ whose graph is given, match the entries of column-I to column-II



Column-I

- (P) $\lim_{t \rightarrow 0^+} g(t) + \lim_{t \rightarrow 2} g(t)$
- (Q) $\lim_{t \rightarrow 0^+} g(t) + g(2)$
- (R) $\lim_{t \rightarrow 0} g(t)$
- (S) $\lim_{t \rightarrow 2} g(t)$

Column-II

- (1) $\lim_{t \rightarrow 2^+} g(t)$ MLT071
- (2) does not exist MLT072
- (3) 0 MLT073
- (4) $\lim_{t \rightarrow 4} g(t)$ MLT074

24.

Column-I

- (P) $\lim_{n \rightarrow \infty} n \sin\left(\frac{\pi}{4n}\right) \cos\left(\frac{\pi}{4n}\right)$ is equal to
- (Q) $\lim_{x \rightarrow 0} \frac{\sin x^\circ}{x}$ is equal to
- (R) $\lim_{x \rightarrow 0} \left(\frac{1}{\sin x} - \frac{1}{\tan x}\right)$ is equal to
- (S) $\lim_{x \rightarrow \pi/2} \frac{1 + \cos 2x}{(\pi - 2x)^2}$ is equal to

Column-II

- (1) 0 MLT075
- (2) $\frac{1}{2}$ MLT076
- (3) $\frac{\pi}{4}$ MLT077
- (4) $\frac{\pi}{180}$ MLT078

25.

Column-I

- (P) $\lim_{x \rightarrow \infty} \frac{2^x}{2^x + 1}$ can be equal to
- (Q) $\lim_{x \rightarrow 2} \frac{2 \sin(e^{x-2} - 1)}{\log(x-1)}$ is equal to
- (R) $\lim_{x \rightarrow e} \frac{(\ln x - 1)e}{x - e}$ is equal to
- (S) $\lim_{x \rightarrow 0} \frac{x(5^x - 1)}{(1 - \cos x)4 \ln 5}$ is equal to

Column-II

- (1) 2 MLT079
- (2) 1 MLT080
- (3) $\frac{1}{2}$ MLT081
- (4) 0 MLT082

EXERCISE - S

1. $\lim_{x \rightarrow \infty} \frac{(x+1)^{10} + (x+2)^{10} + \dots + (x+100)^{10}}{x^{10} + 10^{10}}$ is equal to MLT021
2. Let $P_n = \prod_{k=2}^n \left(1 - \frac{1}{k+1} C_2\right)$. If $\lim_{n \rightarrow \infty} P_n$ can be expressed as lowest rational in the form $\frac{a}{b}$, then value of $(a + b)$ is MLT022
3. $\lim_{x \rightarrow 0} \left(\left[\frac{-5 \sin x}{x} \right] + \left[\frac{6 \sin x}{x} \right] \right)$ (where $[.]$ denotes greatest integer function) is equal to - MLT023
4. Let $f(x) = \frac{\sin\{x\}}{x^2 + ax + b}$. If $f(5^+)$ & $f(3^+)$ exists finitely and are not zero, then the value of $(a + b)$ is (where $\{.\}$ represents fractional part function) - MLT024
5. $\lim_{n \rightarrow \infty} (4^n + 5^n)^{\frac{1}{n}}$ is equal to MLT025
6. $\lim_{x \rightarrow 1} \frac{x^2 - x \cdot \ln x + \ln x - 1}{x - 1}$ MLT026
7. $\lim_{x \rightarrow 0} [\ell n(1 + \sin^2 x) \cdot \cot(\ell n^2(1 + x))]$ MLT027
8. If $\lim_{x \rightarrow \infty} \frac{a(2x^3 - x^2) + b(x^3 + 5x^2 - 1) - c(3x^3 + x^2)}{a(5x^4 - x) - bx^4 + c(4x^4 + 1) + 2x^2 + 5x} = 1$, then the value of $(a + b + c)$ can be expressed in the lowest form as $\frac{p}{q}$. Find the value of $(p + q)$. MLT028
9. $\lim_{x \rightarrow 0} \frac{2^x - 1}{(1+x)^{1/2} - 1} = \ln k$, where k is equal to MLT029
10. $L = \lim_{x \rightarrow \infty} x^2 \left(\sqrt{\frac{x+2}{x}} - \sqrt[3]{\frac{x+3}{x}} \right)$ then $2L$ equal to MLT030

EXERCISE - JEE (Main) PYQ

1. For each $t \in R$, let $[t]$ be the greatest integer less than or equal to t . Then

$$\lim_{x \rightarrow 0^+} x \left(\left[\frac{1}{x} \right] + \left[\frac{2}{x} \right] + \dots + \left[\frac{15}{x} \right] \right)$$

[JEE (Main) 2018]

- (1) is equal to 15. (2) is equal to 120.
 (3) does not exist (in R). (4) is equal to 0.

MLT038

2.
$$\lim_{y \rightarrow 0} \frac{\sqrt{1 + \sqrt{1 + y^4}} - \sqrt{2}}{y^4}$$

[JEE (Main) 2019]

- (1) exists and equals $\frac{1}{4\sqrt{2}}$ (2) does not exist
 (3) exists and equals $\frac{1}{2\sqrt{2}}$ (4) exists and equals $\frac{1}{2\sqrt{2}(\sqrt{2}+1)}$

MLT039

3. For each $x \in R$, let $[x]$ be the greatest integer less than or equal to x . Then $\lim_{x \rightarrow 0^-} \frac{x([x] + |x|)\sin[x]}{|x|}$ is

[JEE (Main) 2019]

- equal to (1) $-\sin 1$ (2) 0 (3) 1 (4) $\sin 1$

MLT040

4. For each $t \in R$, let $[t]$ be the greatest integer less than or equal to t .

Then,
$$\lim_{x \rightarrow 1^+} \frac{(1 - |x| + \sin |1 - x|) \sin \left(\frac{\pi}{2} [1 - x] \right)}{|1 - x| [1 - x]}$$

[JEE (Main) 2019]

- (1) equals -1 (2) equals 1 (3) does not exist (4) equals 0

MLT041

5. Let $[x]$ denote the greatest integer less than or equal to x .

Then
$$\lim_{x \rightarrow 0} \frac{\tan(\pi \sin^2 x) + (|x| - \sin(x[x]))^2}{x^2}$$

[JEE (Main) 2019]

- (1) equals π (2) equals 0 (3) equals $\pi + 1$ (4) does not exist

MLT042

6.
$$\lim_{x \rightarrow \pi/4} \frac{\cot^3 x - \tan x}{\cos \left(x + \frac{\pi}{4} \right)}$$
 is :

[JEE (Main) 2019]

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

MLT043

7.
$$\lim_{x \rightarrow 1^-} \frac{\sqrt{\pi} - \sqrt{2 \sin^{-1} x}}{\sqrt{1 - x}}$$
 equal to :

[JEE (Main) 2019]

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

MLT044

Limits

8. $\lim_{x \rightarrow 0} \frac{\sin^2 x}{\sqrt{2} - \sqrt{1 + \cos x}}$ equals : [JEE (Main) 2019]
 (1) $2\sqrt{2}$ (2) $4\sqrt{2}$ (3) $\sqrt{2}$ (4) 4
MLT045
9. If $\lim_{x \rightarrow 1} \frac{x^4 - 1}{x - 1} = \lim_{x \rightarrow k} \frac{x^3 - k^3}{x^2 - k^2}$, then k is : [JEE (Main) 2019]
 (1) $\frac{3}{8}$ (2) $\frac{3}{2}$ (3) $\frac{4}{3}$ (4) $\frac{8}{3}$
MLT046
10. If $\lim_{x \rightarrow 1} \frac{x^2 - ax + b}{x - 1} = 5$, then $a + b$ is equal to :- [JEE (Main) 2019]
 (1) -7 (2) -4 (3) 5 (4) 1
MLT047
11. $\lim_{x \rightarrow 2} \frac{3^x + 3^{3-x} - 12}{3^{-x/2} - 3^{1-x}}$ is equal to. [JEE (Main) 2020]
MLT048
12. $\lim_{x \rightarrow 0} \left(\frac{3x^2 + 2}{7x^2 + 2} \right)^{\frac{1}{x^2}}$ is equal to [JEE (Main) 2020]
 (1) $\frac{1}{e}$ (2) e^2 (3) e (4) $\frac{1}{e^2}$
MLT049
13. If $\lim_{x \rightarrow 1} \frac{x + x^2 + x^3 + \dots + x^n - n}{x - 1} = 820, (n \in \mathbb{N})$ then the value of n is equal to. [JEE (Main) 2020]
MLT050
14. $\lim_{x \rightarrow 0} \left(\tan \left(\frac{\pi}{4} + x \right) \right)^{1/x}$ is equal to : [JEE (Main) 2020]
 (1) 2 (2) e (3) 1 (4) e^2
MLT051
15. $\lim_{n \rightarrow \infty} \tan \left\{ \sum_{r=1}^n \tan^{-1} \left(\frac{1}{1+r+r^2} \right) \right\}$ is equal to. [JEE (Main) 2021]
MLT052
16. The value of $\lim_{x \rightarrow 0^+} \frac{\cos^{-1}(x - [x]^2) \cdot \sin^{-1}(x - [x]^2)}{x - x^3}$, where $[x]$ denotes the greatest integer $\leq x$ is : [JEE (Main) 2021]
 (1) π (2) 0 (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$
MLT097
17. If $\lim_{x \rightarrow \infty} (\sqrt{x^2 - x + 1} - ax) = b$, then the ordered pair (a, b) is: [JEE (Main) 2021]
 (1) $\left(1, \frac{1}{2} \right)$ (2) $\left(1, -\frac{1}{2} \right)$ (3) $\left(-1, \frac{1}{2} \right)$ (4) $\left(-1, -\frac{1}{2} \right)$
MLT098

18. $\lim_{x \rightarrow 0} \frac{\sin^2(\pi \cos^4 x)}{x^4}$ is equal to : [JEE (Main) 2021]
 (1) π^2 (2) $2\pi^2$ (3) $4\pi^2$ (4) 4π MLT099

19. $\lim_{x \rightarrow \frac{\pi}{2}} \left(\tan^2 x \left((2\sin^2 x + 3\sin x + 4)^{\frac{1}{2}} - (\sin^2 x + 6\sin x + 2)^{\frac{1}{2}} \right) \right)$ is equal to [JEE (Main) 2022]
 (1) $\frac{1}{12}$ (2) $-\frac{1}{18}$ (3) $-\frac{1}{12}$ (4) $-\frac{1}{6}$ MLT100

20. $\lim_{x \rightarrow 0} \frac{\cos(\sin x) - \cos x}{x^4}$ is equal to : [JEE (Main) 2022]
 (1) $\frac{1}{3}$ (2) $\frac{1}{4}$ (3) $\frac{1}{6}$ (4) $\frac{1}{12}$ MLT101

21. $\lim_{x \rightarrow \frac{1}{\sqrt{2}}} \frac{\sin(\cos^{-1} x) - x}{1 - \tan(\cos^{-1} x)}$ is equal to : [JEE (Main) 2022]
 (1) $\sqrt{2}$ (2) $-\sqrt{2}$ (3) $\frac{1}{\sqrt{2}}$ (4) $-\frac{1}{\sqrt{2}}$ MLT102

22. $\lim_{x \rightarrow \infty} \frac{(\sqrt{3x+1} + \sqrt{3x-1})^6 + (\sqrt{3x+1} - \sqrt{3x-1})^6}{(x + \sqrt{x^2-1})^6 + (x - \sqrt{x^2-1})^6} x^3$ [JEE (Main) 2023]
 (1) is equal to 9 (2) is equal to 27 (3) does not exist (4) is equal to $\frac{27}{2}$ MLT103

23. The value of $\lim_{n \rightarrow \infty} \frac{1+2-3+4+5-6+\dots+(3n-2)+(3n-1)-3n}{\sqrt{2n^4+4n+3}-\sqrt{n^4+5n+4}}$ is : [JEE (Main) 2023]
 (1) $\frac{\sqrt{2}+1}{2}$ (2) $3(\sqrt{2}+1)$ (3) $\frac{3}{2}(\sqrt{2}+1)$ (4) $\frac{3}{2\sqrt{2}}$ MLT104

24. The set of all values of a for which $\lim_{x \rightarrow a} ([x-5] - [2x+2]) = 0$, where $[x]$ denotes the greater integer less than or equal to x is equal to [JEE (Main) 2023]
 (1) $(-7.5, -6.5)$ (2) $[-7.5, -6.5]$ (3) $[-7.5, -6.5]$ (4) $[-7.5, -6.5)$ MLT105

25. $\lim_{t \rightarrow 0} \left(1^{\frac{1}{\sin^2 t}} + 2^{\frac{1}{\sin^2 t}} + \dots + n^{\frac{1}{\sin^2 t}} \right)^{\sin^2 t}$ is equal to [JEE (Main) 2023]
 (1) $n^2 + n$ (2) n (3) $\frac{n(n+1)}{2}$ (4) n^2 MLT106

26. If $\lim_{x \rightarrow 0} \frac{e^{ax} - \cos(bx) - \frac{cxe^{-cx}}{2}}{1 - \cos(2x)} = 17$, then $5a^2 + b^2$ is equal to [JEE (Main) 2023]
 (1) 72 (2) 76 (3) 68 (4) 64 MLT107

EXERCISE - JEE (Advanced) PYQ

1. Let $L = \lim_{x \rightarrow 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4}$, $a > 0$. If L is finite, then - [JEE 2009]
- (A) $a = 2$ (B) $a = 1$ (C) $L = \frac{1}{64}$ (D) $L = \frac{1}{32}$
- MLT083
2. If $\lim_{x \rightarrow 0} [1 + x \ln(1 + b^2)]^{\frac{1}{x}} = 2b \sin^2 \theta$, $b > 0$ and $\theta \in (-\pi, \pi]$, then the value of θ is - [JEE 2011]
- (A) $\pm \frac{\pi}{4}$ (B) $\pm \frac{\pi}{3}$ (C) $\pm \frac{\pi}{6}$ (D) $\pm \frac{\pi}{2}$
- MLT084
3. If $\lim_{x \rightarrow \infty} \left(\frac{x^2 + x + 1}{x + 1} - ax - b \right) = 4$, then - [JEE 2012]
- (A) $a = 1, b = 4$ (B) $a = 1, b = -4$
(C) $a = 2, b = -3$ (D) $a = 2, b = 3$
- MLT085
4. Let $\alpha(a)$ and $\beta(a)$ be the roots of the equation $(\sqrt[3]{1+a}-1)x^2 + (\sqrt{1+a}-1)x + (\sqrt[5]{1+a}-1) = 0$ where $a > -1$. Then $\lim_{a \rightarrow 0^+} \alpha(a)$ and $\lim_{a \rightarrow 0^+} \beta(a)$ are [JEE 2012]
- (A) $-\frac{5}{2}$ and 1 (B) $-\frac{1}{2}$ and -1 (C) $-\frac{7}{2}$ and 2 (D) $-\frac{9}{2}$ and 3
- MLT086
5. The largest value of the non-negative integer a for which $\lim_{x \rightarrow 1} \left\{ \frac{-ax + \sin(x-1) + a}{x + \sin(x-1) - 1} \right\}^{\frac{1-x}{1-\sqrt{x}}} = \frac{1}{4}$ is [JEE (Advanced) 2014]
- MLT087
6. Let m and n be two positive integers greater than 1. If $\lim_{\alpha \rightarrow 0} \left(\frac{e^{\cos(\alpha^n)} - e}{\alpha^m} \right) = -\left(\frac{e}{2} \right)$ then the value of $\frac{m}{n}$ is [JEE (Advanced) 2015]
- MLT088
7. Let $\alpha, \beta \in \mathbb{R}$ be such that $\lim_{x \rightarrow 0} \frac{x^2 \sin(\beta x)}{\alpha x - \sin x} = 1$. Then $6(\alpha + \beta)$ equals [JEE (Advanced) 2016]
- MLT089
8. Let $f(x) = \frac{1-x(1+|1-x|)}{|1-x|} \cos\left(\frac{1}{1-x}\right)$ for $x \neq 1$. Then [JEE (Advanced) 2017]
- (C) $\lim_{x \rightarrow 1} f(x) = 0$ (D) $\lim_{x \rightarrow 1^+} f(x) = 0$
(A) $\lim_{x \rightarrow 1^+} f(x)$ does not exist (B) $\lim_{x \rightarrow 1^-} f(x)$ does not exist
- MLT090

9. For any positive integer n , define $f_n : (0, \infty) \rightarrow \mathbb{R}$ as

$$f_n(x) = \sum_{j=1}^n \tan^{-1} \left(\frac{1}{1+(x+j)(x+j-1)} \right) \text{ for all } x \in (0, \infty).$$

(Here, the inverse trigonometric function $\tan^{-1} x$ assume values in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.)

Then, which of the following statement(s) is (are) TRUE ?

[JEE (Advanced) 2018]

(A) $\sum_{j=1}^5 \tan^2(f_j(0)) = 55$

(B) $\sum_{j=1}^{10} (1 + f_j'(0)) \sec^2(f_j(0)) = 10$

(C) For any fixed positive integer n , $\lim_{x \rightarrow \infty} \tan(f_n(x)) = \frac{1}{n}$

(D) For any fixed positive integer n , $\lim_{x \rightarrow \infty} \sec^2(f_n(x)) = 1$

MLT091

10. Let $F : \mathbb{R} \rightarrow \mathbb{R}$ be a function. We say that f has

PROPERTY 1 if $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{\sqrt{|h|}}$ exists and is finite, and

PROPERTY 2 if $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{h^2}$ exists and is finite.

Then which of the following options is/are correct ?

[JEE (Advanced) 2019]

(A) $f(x) = x|x|$ has PROPERTY 2

(B) $f(x) = x^{2/3}$ has PROPERTY 1

(C) $f(x) = \sin x$ has PROPERTY 2

(D) $f(x) = |x|$ has PROPERTY 1

MLT092

11. Let e denote the base of the natural logarithm. The value of the real number a for which the right-

hand limit $\lim_{x \rightarrow 0^+} \frac{(1-x)^{\frac{1}{x}} - e^{-1}}{x^a}$ is equal to a nonzero real number, is.

[JEE (Advanced) 2020]

MLT093

12. The value of the limit $\lim_{x \rightarrow \frac{\pi}{2}} \frac{4\sqrt{2}(\sin 3x + \sin x)}{\left(2 \sin 2x \sin \frac{3x}{2} + \cos \frac{5x}{2}\right) - \left(\sqrt{2} + \sqrt{2} \cos 2x + \cos \frac{3x}{2}\right)}$ is

[JEE (Advanced) 2020]

MLT094

13. Let α be a positive real number. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ and $g : (\alpha, \infty) \rightarrow \mathbb{R}$ be the functions defined by

$$f(x) = \sin\left(\frac{\pi x}{12}\right) \text{ and } g(x) = \frac{2 \log_e(\sqrt{x} - \sqrt{\alpha})}{\log_e(e^{\sqrt{x}} - e^{\sqrt{\alpha}})}. \text{ Then the value of } \lim_{x \rightarrow \alpha^+} f(g(x)) \text{ is } \underline{\hspace{2cm}}.$$

[JEE (Advanced) 2022]

MLT095

14. If $\beta = \lim_{x \rightarrow 0} \frac{e^{x^3} - (1-x^3)^{\frac{1}{3}} + \left((1-x^2)^{\frac{1}{2}} - 1\right) \sin x}{x \sin^2 x}$, then the value of 6β is.

[JEE (Advanced) 2022]

MLT096

JEE (Main) Practice Paper

(This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.)

SECTION-A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:
Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : -1 in all other cases.

1. $\lim_{x \rightarrow 0} \frac{\sqrt[3]{1+x^2} - \sqrt[4]{1-2x}}{x+x^2}$ is equal to
 (1) $\frac{1}{4}$ (2) $\frac{1}{2}$ (3) 1 (4) Does not Exist
MLT003
2. $\lim_{x \rightarrow \infty} (\sqrt{x^2 - 2x - 1} - \sqrt{x^2 - 7x + 3})$ is equal to
 (1) $-\frac{5}{2}$ (2) $\frac{5}{2}$ (3) 0 (4) Does not Exist
MLT004
3. Let $U_n = \frac{n!}{(n+2)!}$ where $n \in \mathbb{N}$. If $S_n = \sum_{r=1}^n U_r$ then $\lim_{n \rightarrow \infty} S_n$ equals
 (1) 2 (2) 1 (3) $\frac{1}{2}$ (4) Non-existent
MLT006
4. Let $f(x) = \left[\frac{\sin x}{x} \right] + \left[\frac{2\sin 2x}{x} \right] + \dots + \left[\frac{10\sin 10x}{x} \right]$ (where $[y]$ is the largest integer $\leq y$). The value of $\lim_{x \rightarrow 0} f(x)$ equals
 (1) 55 (2) 164 (3) 165 (4) 375
MLT009
5. If $f(x)$ is a polynomial of least degree, such that $\lim_{x \rightarrow 0} \left(1 + \frac{f(x)+x^2}{x^2} \right)^{1/x} = e^2$, then $f(2)$ is -
 (1) 2 (2) 8 (3) 10 (4) 12
MLT017
6. $\lim_{n \rightarrow \infty} \frac{e^n}{\left(1 + \frac{1}{n} \right)^{n^2}}$ equals -
 (1) 1 (2) $\frac{1}{2}$ (3) e (4) \sqrt{e}
MLT019

7. $\lim_{x \rightarrow a^-} \left(\frac{|x|^3}{a} - \left[\frac{x}{a} \right]^3 \right)$ ($a < 0$), where $[x]$ denotes the greatest integer less than or equal to x , is equal

to

- (1) $a^2 + 1$ (2) $-a^2 - 1$ (3) a^2 (4) $-a^2$

MLT108

8. $\lim_{n \rightarrow \infty} \cos \frac{x}{2} \cos \frac{x}{2^2} \cos \frac{x}{2^3} \cos \frac{x}{2^4} \dots \dots \cos \frac{x}{2^n}$ is equal to ($x \neq 0$)

- (1) 1 (2) -1 (3) $\frac{\sin x}{x}$ (4) $\frac{x}{\sin x}$

MLT109

9. $\lim_{\theta \rightarrow 0} \left(\left[\frac{n \sin \theta}{\theta} \right] + \left[\frac{n \tan \theta}{\theta} \right] \right)$, where $[.]$ represents greatest integer function and $n \in N$, is equal to

- (1) $2n$ (2) $2n + 1$ (3) $2n - 1$ (4) does not exist

MLT110

10. $\lim_{x \rightarrow 0} \left[(1 - e^x) \frac{\sin x}{|x|} \right]$, where $[.]$ represents greatest integer function, is equal to

- (1) -1 (2) 1 (3) $\log_{\sqrt{2}+1} (3 - \sqrt{2})$ (4) does not exist

MLT111

11. The value of $\lim_{x \rightarrow 0} \frac{\cos(\sin x) - \cos x}{x^4}$ is equal to

- (1) $\lim_{x \rightarrow 0} \frac{\tan x}{x^3}$ (2) $\frac{1}{6}$ (3) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$ (4) $\frac{1}{3}$

MLT112

12. The value of $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin x - (\sin x)^{\sin x}}{1 - \sin x + \ln \sin x}$ is

- (1) 1 (2) 2 (3) 3 (4) $\pi/2$

MLT113

13. The value of $\lim_{x \rightarrow \frac{\pi}{2}} \tan^2 x \left(\sqrt{2 \sin^2 x + 3 \sin x + 4} - \sqrt{\sin^2 x + 6 \sin x + 2} \right)$ is equal to:

- (1) $\frac{1}{10}$ (2) $\frac{1}{11}$ (3) $\frac{1}{12}$ (4) $\frac{1}{8}$

MLT114

14. If α and β be the roots of equation $ax^2 + bx + c = 0$, then $\lim_{x \rightarrow \alpha} (1 + ax^2 + bx + c)^{\frac{1}{x-\alpha}}$ is equal to

- (1) $a(\alpha - \beta)$ (2) $\ln |a(\alpha - \beta)|$ (3) $e^{a(\alpha-\beta)}$ (4) $e^{a|\alpha-\beta|}$

MLT115

15. $\lim_{x \rightarrow \infty} \frac{e^x \left((2^{x^n})^{\frac{1}{e^x}} - (3^{x^n})^{\frac{1}{e^x}} \right)}{x^n}$, $n \in N$, is equal to

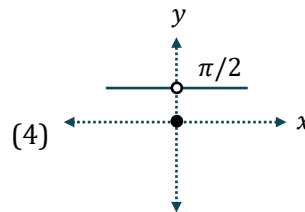
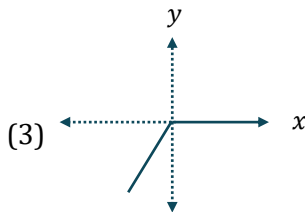
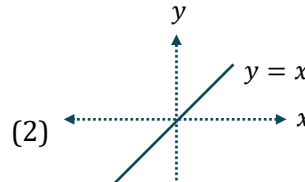
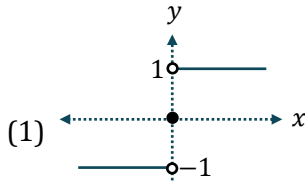
- (1) 0 (2) $\ln \left(\frac{2}{3} \right)$ (3) $\ln \left(\frac{3}{2} \right)$ (4) none of these

MLT116

16. $\lim_{y \rightarrow 0} \left(\lim_{x \rightarrow \infty} \frac{\exp\left(x \ln\left(1 + \frac{a}{x}\right)\right) - \exp\left(x \ln\left(1 + \frac{b}{x}\right)\right)}{y} \right)$ is equal to
 (1) $a + b$ (2) $a - b$ (3) $b - a$ (4) $-(a + b)$

MLT117

17. The graph of the function $f(x) = \lim_{t \rightarrow 0} \left(\frac{2x}{\pi} \cot^{-1} \frac{x}{t^2} \right)$ is



MLT118

18. Let $f(x) = \frac{\sin^{-1}(1-\{x\}) \cdot \cos^{-1}(1-\{x\})}{\sqrt{2\{x\}(1-\{x\})}}$, then $\left(\frac{\lim_{x \rightarrow 0^+} f(x)}{\lim_{x \rightarrow 0^-} f(x)} \right)^2 =$
 (where $\{.\}$ denotes the fractional part function)
 (1) 3 (2) 5 (3) 2 (4) 1

MLT119

19. Let $f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) + \sin\left(\frac{1}{x^2}\right), & x \neq 0 \\ 0, & x = 0 \end{cases}$, then $\lim_{x \rightarrow \infty} f(x)$ is equal to
 (1) 3 (2) 5 (3) 2 (4) 1

MLT120

20. $\lim_{x \rightarrow 0} \left(\frac{1 - \cos x \sqrt{\cos 2x}}{x^2} + \sqrt[3]{\frac{1 + \cos^3 x + 3 \cos^2 x + 3 \cos x}{\cos x + 63}} \right)$ is equal to
 (1) 3 (2) 5 (3) 2 (4) 1

MLT121

SECTION-B

- This section will have **TEN** questions. Candidate can choose to attempt any 5 question out of these 10 questions. In case if candidate attempts more than 5 questions, first 5 attempted questions will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (Answer should be rounded off to the nearest integer).
- Answer to each question will be evaluated according to the following marking scheme:
 Full Marks : +4, if only correct answer is given.
 Zero Marks : 0, if no answer is given.
 Negative Marks : -1 for incorrect answer

1. $\lim_{n \rightarrow \infty} \left(\frac{1}{\sqrt{n^2}} + \frac{1}{\sqrt{n^2+1}} + \frac{1}{\sqrt{n^2+2}} + \dots + \frac{1}{\sqrt{n^2+2n}} \right)$ is equal to **MLT122**

2. The value of $\lim_{x \rightarrow 0} x^2 \left[\frac{1}{x^2} \right]$ where $[.]$ denotes G.I.F., is **MLT123**

3. $\frac{2}{11} \lim_{x \rightarrow 0} \left(\frac{\sin^{-1} x - \tan^{-1} x}{x^3} + \frac{84x \tan^{-1}(\sqrt{2}-1)}{\sin \pi x} \right)$ is equal to **MLT124**

4. If $\lim_{x \rightarrow 0} \frac{x^3}{\sqrt{a+x} (bx - \sin x)} = 1$, then the value of \sqrt{a} where $a > 0$, is **MLT125**

5. If $f(x) = \sum_{\lambda=1}^n \left(x - \frac{5}{\lambda} \right) \left(x - \frac{4}{\lambda+1} \right)$, then $\frac{1}{5} \lim_{n \rightarrow \infty} f(0)$ is equal to **MLT126**

6. Let $f(x) = \begin{cases} (-1)^{[x^2]} & \text{if } x < 0 \\ \lim_{n \rightarrow \infty} \frac{1}{1+x^n} & \text{if } x \geq 0 \end{cases}$. Then $\left(\lim_{x \rightarrow 0^-} 5f(x) + \lim_{x \rightarrow 0^+} 7f(x) \right) \frac{1}{6}$ equals (where $[.]$ represents greatest integer function) **MLT127**

7. The value of $\left[\lim_{x \rightarrow 0} \frac{e - (1+x)^{\frac{1}{x}}}{\tan x} \right]$ where $[.]$ denotes GIF is **MLT128**

8. If $\lim_{x \rightarrow 0} \frac{e^{-nx} + e^{nx} - 2 \cos \frac{nx}{2} - kx^2}{(\sin x - \tan x)}$ exists and finite ($n, k \in N$), then the least value of $\frac{(2k+n)}{2}$ is : **MLT129**

9. If $\lim_{n \rightarrow \infty} \frac{1^2 n + 2^2 (n-1) + 3^2 (n-2) + \dots + n^2 \cdot 1}{1^3 + 2^3 + 3^3 + \dots + n^3} = \frac{a}{b}$ where a and b are coprime numbers then $a + b =$ **MLT130**

10. If $\lim_{n \rightarrow \infty} \frac{n^{98}}{n^x - (n-1)^x} = \frac{1}{99}$, then the value of $\frac{x}{11}$ equals **MLT131**

JEE (Advanced) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION-I

- This section contains **FOUR** questions.
- Each question has FOUR options (A), (B), (C) and (D). ONLY ONE of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:
 Full Marks : +3, if only the bubble corresponding to the correct option is darkened.
 Zero Marks : 0, if none of the bubbles is darkened.
 Negative Marks : -1, in all other cases

1. Let $f(x) = \frac{x^2 - 9x + 20}{x - [x]}$ (where $[x]$ denotes greatest integer less than or equal to x), then

- (A) $\lim_{x \rightarrow 5^-} f(x) = 0$ (B) $\lim_{x \rightarrow 5^+} f(x) = 0$
 (C) $\lim_{x \rightarrow 5} f(x)$ exists (D) none of these

MLT132

2. If $f(x) = \frac{\cos 2 - \cos 2x}{x^2 - |x|}$, then

- (A) $\lim_{x \rightarrow -1} f(x) = 2 \sin 2$ (B) $\lim_{x \rightarrow 1} f(x) = 2 \sin 3$
 (C) $\lim_{x \rightarrow -1} f(x) = 2 \cos 2$ (D) $\lim_{x \rightarrow 1} f(x) = 2 \cos 2$

MLT133

3. If $\ell = \lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x^3} = \lim_{x \rightarrow 0} \frac{1 + a \cos x}{x^2} - \lim_{x \rightarrow 0} \frac{b \sin x}{x^3}$, where $\ell \in R$, then

- (A) $(a, b) = (-1, 1)$
 (B) a & b are any real numbers
 (C) $\ell = 0$
 (D) $\ell = \frac{1}{2}$

MLT134

4. Let $f(x) = \frac{|x + \pi|}{\sin x}$, then

- (A) $f(-\pi^+) = 1$ (B) $f(-\pi^-) = -1$
 (C) $\lim_{x \rightarrow -\pi} f(x)$ does not exist (D) $\lim_{x \rightarrow \pi} f(x)$ exists

MLT135

SECTION-II

- This section contains **FOUR** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +4 if only (all) the correct option(s) is (are) chosen.
Partial Marks : +3 if all the four options are correct but **ONLY** three options are chosen.
Partial Marks : +2 if three or more options are correct but **ONLY** two options are chosen, both of which are correct options.
Partial Marks : +1 if two or more options are correct but **ONLY** one option is chosen and it is a correct option.
Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).
Negative Marks : -2 in all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in -2 marks.

5. Which of the following limits equal to $\frac{1}{2}$?

(A) $\lim_{n \rightarrow \infty} \left(\frac{1}{1.3} + \frac{1}{3.5} + \dots + \frac{1}{(2n-1)(2n+1)} \right)$

(B) $\lim_{x \rightarrow \infty} \left[\frac{3x^2}{2x+1} - \frac{(2x-1)(3x^2+x+2)}{4x^2} \right]$

(C) $\lim_{n \rightarrow \infty} \frac{1}{n^2} (1 + 2 + 3 + \dots + n)$

(D) $\lim_{n \rightarrow \infty} \frac{(n+2)! + (n+1)!}{(n+2)! - (n+1)!}$

MLT054

6. Let $f(x) = x + \sqrt{x^2 + 2x}$ and $g(x) = \sqrt{x^2 + 2x} - x$, then

(A) $\lim_{x \rightarrow \infty} g(x) = 1$

(B) $\lim_{x \rightarrow \infty} f(x) = 1$

(C) $\lim_{x \rightarrow -\infty} f(x) = -1$

(D) $\lim_{x \rightarrow -\infty} g(x) = -1$

MLT057

7. Which of the following limits does not exist?

(A) $\lim_{x \rightarrow 1^+} ([x])^{\frac{1}{x-1}}$

(B) $\lim_{x \rightarrow 3} \frac{(x^2 - 9) - \sqrt{x^2 - 6x + 9}}{|x-1| - 2}$

(C) $\lim_{x \rightarrow 0^+} (x)^{\ell n x}$

(D) $\lim_{x \rightarrow 0^+} \left(\frac{1 - \cos(\sin^2 x)}{x^2} \right)^{\frac{\ell n(1-2x^2)}{\sin^2 x}}$

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

MLT059

8. If $\ell = \lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x^3} = \lim_{x \rightarrow 0} \frac{1 + a \cos x}{x^2} - \lim_{x \rightarrow 0} \frac{b \sin x}{x^3}$, where $\ell \in R$, then

(A) $(a, b) = (-1, 0)$

(B) a & b are any real numbers

(C) $\ell = 0$

(D) $\ell = \frac{1}{2}$

MLT061

SECTION-III

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D) **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	if only the bubble corresponding to the correct answer is darkened.
Zero Marks	:	0	in all other cases.

Comprehension # 1 (Q. No. 9 - 10)

Let $a_1 = 1$ and $a_n = \sin(a_{n-1})$, $n > 1$ & $n \in N$.

If $\lim_{n \rightarrow \infty} \frac{2^{2a_n} - 2^{1+a_n} \cdot 3^{a_n} + 3^{2a_n}}{\cos a_n + 1 - e^{a_n} - e^{-a_n}} = -\frac{\alpha}{3} \ln^\beta \left(\frac{2}{3} \right)$, (where α and β are prime numbers).

On the basis of above information, answer the following:

9. The value of 3α is:

(A) 15 (B) 6 (C) 9 (D) 21

MLT136

10. The value of 2β is:

(A) 10 (B) 14 (C) 4 (D) 6

MLT137

Comprehension # 2 (Q. No. 11 - 12)

Consider two functions $f(x) = \lim_{n \rightarrow \infty} \left(\cos \frac{x}{\sqrt{n}} \right)^n$ and $g(x) = -x^{4b}$,

where $b = \lim_{x \rightarrow \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1} \right)$, then

11. Number of solutions of equation $f(x) + g(x) = 0$ is

(A) 2 (B) 4 (C) 0 (D) 1

MLT138

12. $f(x)$ is

(A) e^{-x^2} (B) $e^{-\frac{x^2}{2}}$ (C) e^{x^2} (D) $e^{\frac{x^2}{2}}$

MLT139

SECTION-IV

- This section contains **SIX** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darkening the corresponding bubbles in the ORS.
For Example : If answer is -77.25, 5.2 then fill the bubbles as follows.

+					-				
●	●	○	○	○	●	●	○	○	○
①	①	①	①	①	①	①	①	①	①
②	②	②	②	●	②	②	②	②	●
③	③	③	③	③	③	③	③	③	③
④	④	④	④	④	④	④	④	④	④
⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	●	⑤
⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥
⑦	⑦	●	●	⑦	⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨

- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 If ONLY the correct numerical value is entered as answer.
Zero Marks : 0 In all other cases.

13. Let $f(x) = \frac{\sin^{-1}(1-\{x\}) \cdot \cos^{-1}(1-\{x\})}{\sqrt{2\{x\}} (1-\{x\})}$, then $\left(\lim_{x \rightarrow 0^+} f(x)\right)^2 = \lim_{x \rightarrow 0} f(x)$ (where $\{ \cdot \}$ denotes the fractional part function) **MLT140**

14. Let $f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) + \sin\left(\frac{1}{x^2}\right), & x \neq 0 \\ 0, & x = 0 \end{cases}$, then $\lim_{x \rightarrow \infty} f(x)$ is equal to **MLT141**

15. $\lim_{x \rightarrow 0} \left(\frac{1 - \cos x \sqrt{\cos 2x}}{x^2} + \sqrt[3]{\frac{1 + \cos^3 x + 3 \cos^2 x + 3 \cos x}{\cos x + 63}} \right)$ is equal to **MLT142**

16. If $\lim_{x \rightarrow \infty} f(x)$ exists and is finite and nonzero and $\lim_{x \rightarrow \infty} \left(f(x) + \frac{3f(x)-1}{f^2(x)} \right) = 3$, then the value of $\lim_{x \rightarrow \infty} f(x)$ is equal to **MLT143**

17. If $f(x) = \begin{cases} x-1, & x \geq 1 \\ 2x^2-2, & x < 1 \end{cases}$, $g(x) = \begin{cases} x+1, & x > 0 \\ -x^2+1, & x \leq 0 \end{cases}$ and $h(x) = |x|$, then $\lim_{x \rightarrow \infty} f(g(h(x)))$ is equal to

18. If $f(x) = \begin{cases} \sin x, & x \neq n\pi, n = 0, \pm 1, \pm 2, \dots \\ 2, & \text{otherwise} \end{cases}$ and $g(x) = \begin{cases} x^2+1, & x \neq 0, 2 \\ 4, & x = 0 \\ 5, & x = 2 \end{cases}$, then $\lim_{x \rightarrow 0} g(f(x))$ is equal **MLT145**

ANSWER KEY

EXERCISE - O

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	A	B	C	A	C	B	A	C	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	A,B,C	B,C	A,B	B,C	B	A	A	-1.00	-0.33
Que.	21	22	23				24			
Ans.	0	B	P → 1,3; Q → 1,3; R → 2; S → 2				P → 3; Q → 4; R → 1; S → 2			
Que.	25									
Ans.	P → 2; Q → 1; R → 2; S → 3									

EXERCISE - S

1.	100	2.	4	3.	0	4.	7	5.	5
6.	2	7.	1	8.	167	9.	4	10.	1

EXERCISE - JEE (Main) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	1	1	4	4	3	3	2	4	1
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	36	4	40	4	1	4	2	3	1	3
Que.	21	22	23	24	25	26				
Ans.	4	2	3	1	2	3				

EXERCISE - JEE (Advanced) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A,C	D	B	B	0	2	7	A,C	D	B,D
Que.	11	12	13	14						
Ans.	1.00	8	0.50	5						

JEE (Main) Practice Paper

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	2	1	3	4	4	4	2	3	3	1
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	2	2	3	3	2	2	3	3	4	3
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	2	1	2	6	4	2	1	6	4	9

JEE (Advanced) Practice Paper

Section-I	Q.	1	2	3	4			
	A.	A	A	D	C			
Section-II	Q.	5	6	7	8			
	A.	A,C	A,C	B,C,D	A,D			
Section-III	Q.	9	10	11	12			
	A.	B	C	A	B			
Section-IV	Q.	13	14	15	16	17	18	
	A.	2	1	2	1	0	1	