



MATHS

BOOKS - OBJECTIVE RD SHARMA MATHS VOL I (HINGLISH)

LIMITS

Illustration

1. The left hand limit of the function $f(x)=4$

A. 1

B. -1

C. 0

D. non-existent

Answer: B



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2. The right hand limit of the function $f(x) = 4$

- A. 1
- B. -1
- C. 0
- D. non-existent

Answer: A



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3. Let $f(x) = [x]$ = Greatest integer less than or equal to x and k be an integer. Then, which one of the following is not correct?

- A. $\lim_{x \rightarrow k^-} f(x) = k - 1$
- B. $\lim_{x \rightarrow k} f(x) = k$

C. $\lim_{x \rightarrow k} f(x)$ exists

D. $\lim_{x \rightarrow k} f(x)$ does not exist

Answer: C



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4. $\lim_{x \rightarrow 0} \frac{e^{1/x} - 1}{e^{1/x} + 1} =$

A. -1

B. 1

C. 0

D. non-existent

Answer: D



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5. If f is an odd function and if $\lim_{x \rightarrow 0} f(x)$ exists. Prove that this limit must be zero.

A. 0

B. -1

C. 1

D. non-existent

Answer: A



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6. $\lim_{x \rightarrow k} (x - [x])$, where k is an integer, is equal to (where $[x]$ denotes greatest integer function)

A. -1

B. 1

C. 0

D. 2

Answer: B

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7. $\lim_{x \rightarrow 2^+} \left(\frac{[x]^3}{3} - \left[\frac{x}{3} \right]^3 \right)$ is

A. 0

B. $\frac{64}{27}$

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

D. non of these

Answer: C

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8. Let $f(x) = \left(\frac{1 - x(1 + |1 - x|)}{|1 - x|} \right) \cos \left(\frac{1}{1 - x} \right)$ for $x \neq 1$

A. $\lim_{x \rightarrow 1^-} f(x) = 0$

B. $\lim_{x \rightarrow 1^-} f(x)$ does not exist

C. $\lim_{x \rightarrow 1^+} f(x) = 0$

D. $\lim_{x \rightarrow 1^+}$ does not exist.

Answer: A:D



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9. If $n \in \mathbb{N}$, and $[x]$ denotes the greatest integer less than or equal to x ,

then $\lim_{x \rightarrow n} (-1)^{[x]}$ is equal to.

A. 1

B. -1

C. 0

D. none of these

Answer: D

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10. $\lim_{x \rightarrow 2} \frac{5}{\sqrt{2} - \sqrt{x}}$

A. $10\sqrt{2}$

B. ∞

C. $-\infty$

D. non-existent (विद्यमान नहीं है)

Answer: D

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11. $\lim_{x \rightarrow 3} ([x - 3] + [3 - x] - x)$, where $[.]$ denotes the greatest integer

function, is equal to

A. 4

B. -4

C. 0

D. none of these

Answer: B



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12. For $[.] = G. I. F. ; \lim_{x \rightarrow \sqrt{3}} [x^2]$, is

A. 3

B. 2

C. non-existent (विद्यमान नहीं)

D. none of these (इनमे से कोई नहीं)

Answer: C



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13. If $f: R \rightarrow R$ is defined by (where $[.]$ is g.i.f) $f(x) = [x - 3] + |x - 4|$

for $x \in R$ then $\lim_{x \rightarrow 3^-} f(x) =$

A. -2

B. -1

C. 0

D. 1

Answer: C



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14. If $f(x) = \begin{cases} [x]^2 + \sin[x] & \text{for } [x] \neq 0 \\ 0 & \text{for } [x] = 0 \end{cases}$ where $[x]$ denotes the

greatest integer function, then, $\lim_{x \rightarrow 0} f(x)$, is

A. 1

B. 0

C. -1

D. non-existent

Answer: D



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15. If $f(x) = x \frac{e^{[x] + |x|} - 2}{[x] + |x|}$, then $\lim_{x \rightarrow 0} f(x)$ is.

A. -1

B. 0

C. 1

D. non-existent

Answer: D



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16. $\lim_{x \rightarrow -2} \frac{(x^2 - x - 6)^2}{(x + 2)^2} =$

A. 6

B. 25

C. 9

D. 16

Answer: B



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17. $\lim_{x \rightarrow 1^+} \frac{\sqrt{x^2 - 1} + \sqrt{x - 1}}{\sqrt{x^2 - 1}} =$

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

B. $\sqrt{2} + 1$

C. 1

D. $1 + \frac{1}{\sqrt{2}}$

Answer: D



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18. $\lim_{x \rightarrow \sqrt{3}} \left(\frac{x^2 - 3}{x^2 + 3\sqrt{3}x - 12} \right)$ is equal to.

A. $\frac{1}{5}$

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

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

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

Answer: B



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19. $\lim_{x \rightarrow 1} \frac{1 - x^{-2/3}}{1 - x^{-1/3}}$ is equal

A. 2

B. 1

C. $2/3$

D. none of these

Answer: A



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20. $\lim_{x \rightarrow 1} \frac{x^8 - 2x + 1}{x^4 - 2x + 1}$ equals

A. 3

B. 0

C. -3

D. 1

Answer: A



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21. $\lim_{x \rightarrow \pi/6} \frac{2 \sin^2 x + \sin x - 1}{2 \sin^2 x - 3 \sin x + 1} =$

A. 3

B. -3

C. 6

D. 0

Answer: B



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22. Let $p(x)$ be a real polynomial of degree 4 having extreme values

$x = 1$ and $x = 2$. if $\lim_{x \rightarrow 0} \frac{p(x)}{x^2} = 1$, then $p(4)$ is equal to

A. 0

B. 16

C. 32

D. 64

Answer: B

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23. $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x}$ is equal to

A. $1/2$

B. 2

C. 0

D. 1

Answer: A

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24. The value of $\lim_{x \rightarrow 0} \frac{\sqrt{a^2 - ax + x^2} - \sqrt{a^2 + ax + x^2}}{\sqrt{a+x} - \sqrt{a-x}}$, is

A. a

B. \sqrt{a}

C. $-a$

D. $-\sqrt{a}$

Answer: B



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25. $\lim_{x \rightarrow 2} \frac{\sqrt{1 + \sqrt{2 + x}} - \sqrt{3}}{x - 2} =$

A. $\frac{1}{8\sqrt{3}}$

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

C. $8\sqrt{3}$

D. $\sqrt{3}$

Answer: A



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26. The value of $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{\sqrt{x^2 + 9} - 3}$, is

A. 3

B. 4

C. 1

D. 2

Answer: A

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27. The value of $\lim_{x \rightarrow b} \frac{\sqrt{x-a} - \sqrt{b-a}}{x^2 - b^2}$, for $b > a$, is

A. $\frac{1}{4b\sqrt{a-b}}$

B. $\frac{1}{4b(\sqrt{b-a})}$

C. $\frac{1}{4a\sqrt{a-b}}$

D. $\frac{1}{b\sqrt{b-a}}$

Answer: B



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28. The value of $\lim_{x \rightarrow 2a} \frac{\sqrt{x-2a} + \sqrt{x} - \sqrt{2a}}{\sqrt{x^2 - 4a^2}}$ is

A. $\frac{1}{\sqrt{a}}$

B. $\frac{1}{2\sqrt{a}}$

C. $\frac{\sqrt{a}}{2}$

D. $2\sqrt{a}$

Answer: B



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29. $\lim_{x \rightarrow a} \frac{x^m - a^m}{x^n - a^n} = \left(\frac{m}{n}\right)a^{m-n}$ if $m > n$

A. $\frac{m}{n}a^{m-n}$

B. $\frac{n}{m}a^{m-n}$

C. $\frac{m}{n}a^{m+n}$

D. $\frac{m}{n}$

Answer: A



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30. If the value of $\lim_{x \rightarrow 0} \frac{(1-x)^n - 1}{x}$ is 100, then $n =$

A. 100

B. -100

C. 99

D. -99

Answer: B



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31. The value of $\lim_{x \rightarrow 1} \frac{(x + x^2 + \dots + x^n - n)}{x - 1}$, is

A. n

B. $\frac{n + 1}{2}$

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

D. $\frac{n(n - 1)}{2}$

Answer: C



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32. 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 find the value of k

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

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

C. $\frac{2}{3}$

D. none of these

Answer: B

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33. If $\lim_{x \rightarrow (-a)} \frac{x^9 + a^9}{x + a} = 9$, then find the real value of a

A. ± 1

B. ± 3

C. ± 2

D. $\pm \sqrt{2^{\frac{1}{8}}}$

Answer: A

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34. $\lim_{x \rightarrow \frac{\pi}{4}} \frac{4\sqrt{2} - (\cos x + \sin x)^5}{1 - \sin 2x}$

A. $5\sqrt{2}$

B. $3\sqrt{2}$

C. $\sqrt{2}$

D. none of these

Answer: A

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35. If $\lim_{x \rightarrow 1} \frac{x + x^2 + x^3 + \dots + x^n - n}{x - 1} = 5050$, then $n =$

A. 10

B. 100

C. 150

D. none of these

Answer: B

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36. Evaluate : $(\lim)_{x \rightarrow \infty} \frac{ax^2 + bx + c}{dx^2 + ex + f}$.

A. $\frac{a}{a}$

B. $\frac{d}{a}$

C. $\frac{b}{e}$

D. $\frac{c}{f}$

Answer: A



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37. $\lim_{x \rightarrow \infty} \frac{\sqrt{3x^2 - 1} + \sqrt{2x^2 - 1}}{4x + 3} =$

A. $\frac{\sqrt{3} - \sqrt{2}}{4}$

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

C. $\frac{\sqrt{3} - \sqrt{2}}{2}$

D. none of these

Answer: B



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38. $\lim_{x \rightarrow \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 + 1} \right) =$

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

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

C. 1

D. -1

Answer: B



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39. $\lim_{x \rightarrow -\infty} \left[\sqrt{x^2 + x + 1} + x \right] =$

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

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

C. 1

D. -1

Answer: B

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40. $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 1}{x + 1} - ax - b \right) = 0$ then find values of a & b

A. $a = 1, b = 1$

B. $a = -1, b = 1$

C. $a = 1, b = -1$

D. $a = -1, b = -1$

Answer: C

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41. If $\lim_{x \rightarrow \infty} \left\{ \frac{x^2 + 1}{x + 1} - ax - b \right\} = 2$, then

A. $a = 1, b = 3$

B. $a = -1, b = 3$

C. $a = -1, b = -3$

D. $a = 1, b = -3$

Answer: D



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42. If $\lim_{x \rightarrow \infty} \left\{ \frac{x^2 + 1}{x + 1} - (ax + b) \right\} \rightarrow \infty$, then

A. $a \in (1, \infty)$

B. $a \neq 1, b \in R$

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

D. none of these

Answer: C

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43. If $\lim_{x \rightarrow \infty} \left(\frac{x^2 + x + 1}{x + 1} - ax - b \right) = 4$ then $a = ?$ $b = ?$

A. $a = 1, b = 4$

B. $a = 1, b = -4$

C. $a = 2, b = -3$

D. $a = 2, b = 3$

Answer: B

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44. $\lim_{n \rightarrow \infty} \frac{1 + 2 + 3 + \dots + n}{1 + 3 + 5 + \dots (2n - 1)} =$

A. 1

B. $3/2$

C. $1/2$

D. 2

Answer: C



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45. $\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 \dots + n^2}{n^3}$, is

A. $\frac{1}{6}$

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

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

D. none of these

Answer: B



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46. Value of $\lim_{n \rightarrow \infty} \frac{1^3 + 2^3 + 3^3 \dots + n^3}{n^4}$

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

B. 1

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: C



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47.

Evaluate

:

$$\lim_{n \rightarrow \infty} \frac{1^4 + 2^4 + 3^4 + \dots + n^4}{n^5} - \lim_{n \rightarrow \infty} \frac{1^3 + 2^3 + \dots + n^3}{n^5}$$

A. $\frac{1}{5}$

B. $\frac{1}{30}$

C. 0

D. $\frac{1}{4}$

Answer: A



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48.

If

$S_1 = \Sigma n, S_2 = \Sigma n^2, S_3 = \Sigma n^3$, then the value of $\lim_{n \rightarrow \infty} \frac{S_1 \left(1 + \frac{S_3}{8}\right)}{S_2^2}$

is equal to

A. $\frac{3}{32}$

B. $\frac{3}{64}$

C. $\frac{9}{32}$

D. $\frac{9}{64}$

Answer: D



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49. $\lim_{n \rightarrow \infty} \frac{1.2 + 2.3 + 3.4 + \dots + n(n+1)}{n^3}$

A. 1

B. -1

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

D. none of these

Answer: C



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50. If $[x]$ denotes the greatest integer less than or equal to x then

$$\lim_{n \rightarrow \infty} \frac{[x] + [2x] + [3x] + \dots + [nx]}{n^2}$$

A. $x/2$

B. $x/3$

C. x

D. 0

Answer: A



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51. If $[x]$ denotes the greatest integer less than or equal to x , then

evaluate $(\lim)_{n \rightarrow \infty} \frac{1}{n^3} \{ [1^2x] + [2^2x] + [3^2x] + \dots + [n^2x] \}$

A. $x/2$

B. $x/3$

C. $x/6$

D. 0

Answer: B



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52. $\lim_{x \rightarrow 0} \frac{\sqrt{\frac{1 - \cos 2x}{2}}}{x}$

A. 1

B. -1

C. 0

D. none of these

Answer: D



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53. The value of $\lim_{x \rightarrow 2} \frac{\sqrt{1 - \cos 2(x - 2)}}{x - 2}$, is

A. $\sqrt{2}$

B. $-\sqrt{2}$

C. 2

D. none of these

Answer: D

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54. If $f(x) = \left\{ \frac{\sin[x]}{x}, [x] \neq 0; 0, [x] = 0 \right\}$, Where $[.]$ denotes the greatest integer function, then $\lim_{x \rightarrow 0} f(x)$ is equal to

A. 1

B. 0

C. -1

D. none of these

Answer: D

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55. The value of $\lim_{x \rightarrow 0} \left[\frac{x}{\sin x} \right]$, where $[.]$ represents the greatest integer function, is

A. 1

B. 0

C. -1

D. none of these

Answer: A



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56. The value of $\lim_{x \rightarrow 0} \left[\frac{\sin x}{x} \right]$ is-

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

A. 1

B. 0

C. -1

D. none of these

Answer: B



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57. if $[x]$ denotes the greatest integer less than or equal to x , then

$$\lim_{x \rightarrow 0} \frac{x[x]}{\sin|x|}, \text{ is}$$

A. 0

B. 1

C. non-existent

D. none of these

Answer: C



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58. If $[.]$ denotes the greatest integer function, then $\lim_{x \rightarrow \pi/2} \left[\frac{x - \frac{\pi}{2}}{\cos x} \right]$

is equal to.

A. 1

B. -1

C. 2

D. -2

Answer: D



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59. $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3} =$

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

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. none of these

Answer: A



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60. The value of $\lim_{x \rightarrow \pi/2} \frac{\cot x - \cos x}{(\pi - 2x)^3}$ is

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

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer: D



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61. $\lim_{x \rightarrow \frac{\pi}{6}} \frac{3 \sin x - \sqrt{3} \cos x}{6x - \pi}$

A. $\sqrt{3}$

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

C. $-\sqrt{3}$

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

Answer: B



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62. $\lim_{x \rightarrow 0} \frac{\cos(\sin x) - 1}{x^2} =$

A. 1

B. -1

C. 1/2

D. -1/2

Answer: D



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63. If $f(x) = \begin{cases} \frac{\sin(1 + [x])}{[x]} & \text{for } [x] \neq 0 \\ 0 & \text{for } [x] = 0 \end{cases}$ where $[x]$ denotes the greatest

integer not exceeding x , then $\lim_{x \rightarrow 0^-} f(x) =$

A. -1

B. 0

C. 1

D. 2

Answer: B



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64. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)\sin 5x}{x^2 \sin 3x}$

A. $\frac{10}{3}$

B. $\frac{3}{10}$

C. $\frac{6}{5}$

D. $\frac{5}{6}$

Answer: A



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65. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)^2}{2x \tan x - x \tan 2x}$, is

A. 2

B. $-\frac{1}{2}$

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

D. -2

Answer: D



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66. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4 \tan x}$ is equal to

A. $-(1)/(4)$

B. $(1)/(2)$

C. 1

D. 2

Answer: D



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67. $\lim_{x \rightarrow 0} \frac{\sin(\pi \cos^2 x)}{x^2}$ equals

A. $-\pi$

B. π

C. $\pi/2$

D. 1

Answer: B



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68. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4 \tan x}$ is equal to

A. 2

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

C. 4

D. 3

Answer: A



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69. $\lim_{x \rightarrow \frac{\pi}{2}} \frac{(1 - \tan x / 2)(1 - \sin x)}{(1 - \tan x / 2)(\pi - 2x)^3}$

A. ∞

B. $\frac{1}{8}$

C. 0

D. $\frac{1}{32}$

Answer: D



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70. Let $\alpha, \beta \in R$ such that $\lim_{x \rightarrow 0} \frac{x^2 \sin(\beta x)}{\alpha x - \sin x} = 1$. Then $6(\alpha + \beta)$ equals

A. 6

B. 7

C. 2

D. 12

Answer: B



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71. If $\lim_{x \rightarrow 0} \frac{2ax + (a - 1)\sin x}{\tan^3 x} = l$, then $a + l$ is equal to

A. $\frac{2}{3}$

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

C. $\frac{2}{9}$

D. $\frac{4}{9}$

Answer: D



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72. $\lim_{x \rightarrow 0} \frac{4^x - 1}{3^x - 1}$ equals

A. $\log_3 4$

B. $\log_4 3$

C. $\log_e 4$

D. $\log_3 4$

Answer: A



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73. The value of $\lim_{x \rightarrow 0} \frac{e^{ax} - e^{bx}}{x}$, is

A. $a + b$

B. $a - b$

C. e^{ab}

D. 1

Answer: B



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74. $\lim_{x \rightarrow 0} \frac{a^x - b^x}{e^x - 1}$ is equal to

A. $\log_e \left(\frac{a}{b} \right)$

B. $\log_e \left(\frac{b}{a} \right)$

C. $\log_e ab$

D. $\log_e (a + b)$

Answer: A



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75. $\lim_{x \rightarrow 0} \frac{(1 - e^x)\sin x}{x^2 + x^3} =$

A. -1

B. 0

C. 1

D. 2

Answer: A



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76. The value of $\lim_{x \rightarrow 0} \frac{e^x - e^{\sin x}}{2(x - \sin x)}$, is

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

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

C. 1

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

Answer: B



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77. The value of $\lim_{x \rightarrow 2} \frac{e^{3x-6} - 1}{\sin(2-x)}$, is

A. $3/2$

B. 3

C. -3

D. -1

Answer: C



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78. The value of $\lim_{x \rightarrow 0} \frac{(4^x - 1)^3}{\sin. \frac{x^2}{4} \log(1 + 3x)}$, is

A. $\frac{4}{3}(\ln 4)^2$

B. $\frac{4}{3}(\ln 4)^3$

C. $\frac{3}{2}(\ln 4)^2$

D. $\frac{3}{2}(\ln 4)^3$

Answer: B



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79. The value of $\lim_{x \rightarrow 0} \frac{\log x - 1}{x - e}$, is

A. 1

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

C. e

D. 0

Answer: B



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80. The value of $\lim_{x \rightarrow 1} \frac{\log x}{\sin \pi x}$, is

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

B. $-\pi$

C. π

D. $-\frac{1}{\pi}$

Answer: D



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81. $\lim_{x \rightarrow \pi/2} \frac{a^{\cot x} - a^{\cos x}}{\cot x - \cos x} a > 0$ is equal to

A. $\log_2 \left(\frac{\pi}{2} \right)$

B. $\log_e 2$

C. $\log_e a$

D. a

Answer: C



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82. $\lim_{x \rightarrow 0} \frac{2 \log(1+x) - \log(1+2x)}{x^2}$ is equal to

A. 0

B. 1

C. -1

D. 2

Answer: B



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83. $\lim_{x \rightarrow \infty} \left(1 + \frac{2}{x}\right)^x$ equals

A. e

B. ∞

C. e^2

D. $\frac{1}{e}$

Answer: C



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84. $\lim_{x \rightarrow \infty} \left(1 + \sin. \frac{1}{n}\right)^n$ equals

A. e^a

B. e

C. $e^2 a$

D. 0

Answer: A



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85. The value of $\lim_{x \rightarrow 0} (1 + \sin x)^2$, is

A. e

B. e^2

C. \sqrt{e}

D. none of these

Answer: B



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86. $\lim_{x \rightarrow 1} (\log_3 3x)^{\log_x 3} =$

A. e

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

C. 1

D. $-\frac{1}{e}$

Answer: A



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87. The value of $\lim_{x \rightarrow 0} (\cos x)^{\cot x}$, is

A. e

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

C. 1

D. -1

Answer: C



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88. The value of $\lim_{x \rightarrow 0} \left\{ \frac{a^x + b^x + c^x}{3} \right\}^{1/x}$, is

A. abc

B. $(abc)^{1/3}$

C. $\frac{1}{3}abc$

D. none of these

Answer: B



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89. The value of $\lim_{x \rightarrow a} \left(2 - \frac{a}{x} \right)^{\tan\left(\frac{\pi x}{2a}\right)}$ is:

A. $e^{-1/\pi}$

B. $e^{2/\pi}$

C. $e^{-2/\pi}$

D. $e^{1/\pi}$

Answer: C



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90. The value of $\lim_{x \rightarrow 0} \left\{ \tan\left(\frac{\pi}{4} + x\right) \right\}^{1/x}$, is

A. e

B. e^2

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

D. $\frac{1}{e^2}$

Answer: B



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91. The value of $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{\frac{1}{x^2}}$, is

A. $e^{-1/3}$

B. $e^{1/3}$

C. $e^{-1/6}$

D. $e^{1/6}$

Answer: C



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92. $\lim_{x \rightarrow \infty} \left(\frac{x+5}{x-1} \right)^x$ is equal to

A. e^4

B. e^6

C. e^{-6}

D. e^{-4}

Answer: B



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93. $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 4x - 3}{x^2 - 2x + 5} \right)^x$ is equal to

A. e^6

B. e^{-6}

C. e^2

D. e^4

Answer: A



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94. $\lim_{x \rightarrow \infty} \left(\frac{x + c}{x - c} \right)^x = 4$ then find c.

A. $\log_{10} 2$

B. $\log_e 2$

C. 2

D. none of these

Answer: B



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95. $\lim_{x \rightarrow \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1}$ is equal to

A. e^{12}

B. e^{-12}

C. e^4

D. e^3

Answer: B



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96. Let $p = \lim_{x \rightarrow 0^+} (1 + \tan^2 \sqrt{x})^{\frac{1}{2x}}$ then $\log p$ is equal to`

A. 1

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

C. $\frac{1}{4}$

D. 2

Answer: B



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97. If $\lim_{x \rightarrow \infty} \left(1 + \frac{a}{x} - \frac{4}{x^2}\right)^{2x} = e^3$, the a is equal to

A. $\frac{2}{3}$

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

C. 2

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

Answer: B



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98. If $(\lim)_{x \rightarrow 0} [1 + x \ln(1 + b^2)]^{\frac{1}{x}} = 2b \sin^2 \theta$, $b > 0$, $\theta \in (-\pi, \pi]$,

then the value of θ is $\pm \frac{\pi}{4}$ (a) $\pm \frac{\pi}{3}$ (b) $\pm \frac{\pi}{6}$ (c) $\pm \frac{\pi}{2}$ (d)

A. $\pm \frac{\pi}{4}$

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

C. $\pm \frac{\pi}{6}$

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

Answer: D



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99. If $\lim_{x \rightarrow \infty} \left(1 + \frac{a}{x} + \frac{b}{x^2}\right)^{2x} = e^2$, then

A. $a = 1, b = 2$

B. $a = 2, b = 1$

C. $a = 1, b \in R$

D. $a = b = 1$

Answer: C



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100. $\lim_{x \rightarrow a} \frac{x^a - a^x}{x^x - a^a}$ is equal to

A. $\frac{1 + \log_e a}{1 - \log_e a}$

B. $\frac{\log_e(e/a)}{\log_e(ae)}$

C. $\frac{\log_e(a/e)}{\log_e(ae)}$

D. none of these

Answer: B



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101. Let $f(a) = g(a) = k$ and their n^{th} order derivatives $f^n(a), g^n(a)$ exist and are not equal for some $n \in \mathbb{N}$. Further, if

$$\lim_{x \rightarrow a} \frac{f(a)g(x) - f(a) - g(a)f(x) + g(a)}{g(x) - f(x)} = 4, \text{ then the value of } k, \text{ is}$$

- A. 0
- B. 4
- C. 2
- D. 1

Answer: B



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102. If $(\lim)_{x \rightarrow a} \frac{a^x - x^a}{x^x - a^a} = -1$ and $a > 0$, then find the value of a .

- A. 1
- B. 0
- C. e

D. none of these

Answer: A



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103. $\lim_{x \rightarrow 1} \frac{1 + \log x - x}{1 - 2x + x^2}$ equals

A. 1

B. -1

C. 0

D. none of these

Answer: D



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104. $\lim_{x \rightarrow 0} \frac{\tan x - x}{x^2 \tan x}$ equals

A. 1

B. $1/2$

C. $1/3$

D. none of these

Answer: C



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105. यदि $\lim_{x \rightarrow 0} \frac{ae^x - b \cos x + ce^{-x}}{x \sin x} = 2$, तब $a + b + c =$

A. 2

B. 4

C. 0

D. 6

Answer: B



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106. $\lim_{x \rightarrow 0} x \log_e(\sin x)$ is equal to

A. -1

B. $\log_e 1$

C. 1

D. none of these

Answer: B



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107. If $\lim_{x \rightarrow 0} \frac{\cos 4x + a \cos 2x + b}{x^4}$ is finite then the value of a, b respectively

A. (5, -4)

B. (-5, -4)

C. (-4, 3)

D. (4, 5)

Answer: C



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108. $\lim_{x \rightarrow 0} \frac{1 + x + x^2 - e^x}{x^2}$ is equal to

A. 1

B. 0

C. 1/2

D. none of these

Answer: C



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109. The value of $\lim_{x \rightarrow 0} \frac{(1+x)^{1/x} - e}{x}$ is

A. 1

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

C. $-\frac{e}{2}$

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

Answer: C



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110. Evaluate $\lim_{x \rightarrow 0} \frac{(1+x)^{1/x} - e + \frac{1}{2}es}{x^2}$.

A. $\frac{11e}{24}$

B. $\frac{-11e}{24}$

C. $\frac{e}{24}$

D. none of these

Answer: A



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111. The value of $\lim_{x \rightarrow 0} \frac{1 + \sin x - \cos x + \log(1 - x)}{x^3}$, is

- A. -1
- B. $1/2$
- C. $-1/2$
- D. 1

Answer: C



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112. The value of $\lim_{x \rightarrow 0} \frac{e^x + \log(1 + x) - (1 - x)^{-2}}{x^2}$ is equal to

- A. 0
- B. -3
- C. -1

D. infinity

Answer: B



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Section I - Solved Mcqs

1. For $x \in R$, $\lim_{x \rightarrow \infty} \left(\frac{x-3}{x+2} \right)^x =$

A. e

B. e^{-1}

C. e^{-5}

D. e^5

Answer: C



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2. $\lim_{x \rightarrow 0} \frac{\sin(\pi \cos^2 x)}{x^2}$ equals

A. $-\pi$

B. π

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

D. 1

Answer: B



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

zero number is :

A. 1

B. 2

C. 3

D. 4

Answer: C



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4. A function $f: \mathbb{R} \rightarrow \mathbb{R}$ is such that $f(1) = 3$ and $f'(1) = 6$. Then

$$\lim_{x \rightarrow 0} \left[\frac{f(1+x)}{f(1)} \right]^{1/x} =$$

A. 1

B. $e^{1/2}$

C. e^2

D. e^3

Answer: C



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5. $\lim_{x \rightarrow \infty} \frac{a^x - b^x}{a^x - b^x}$, where $1 < b < a$, is equal to

A. -1

B. 1

C. 0

D. none of these

Answer: B



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6. $\lim_{x \rightarrow \infty} \frac{4^{1/n} - 1}{3^{1/n} - 1}$ is equal to

A. $\log_4 3$

B. $\log_3 4$

C. 1

D. none of these

Answer: B



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7.

$$\lim_{x \rightarrow \infty} \left(\sqrt{x^4 + ax^3 + 3x^2 + bx + 2} - \sqrt{x^4 + 2x^3 + cx^2 + 3x - d} \right) = 4$$

A. 3

B. 5

C. 2

D. any real number

Answer: C



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8. if $\lim_{x \rightarrow 0} (1 + ax)^{\frac{b}{x}} = e^2$, where a and b are natural numbers, then

A. $a = 4, b = 2$

B. $a = 8, b = 4$

C. $a = 16, b = 8$

D. $a = 1, b = 2$

Answer: D



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9. $\lim_{n \rightarrow \infty} (2^n + 5^n)^{1/n}$ is equal to

A. 2

B. 5

C. e

D. none of these

Answer: B



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10. $\lim_{x \rightarrow \infty} \frac{\log[x]}{x}$, where $[x]$ denotes the greatest integer less than or equal to x , is

- A. 0
- B. 1
- C. -1
- D. non-existent

Answer: A



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11. $\lim_{x \rightarrow \infty} \frac{\log x}{[x]}$, where $[.]$ denotes the greatest integer function, is

- A. 0
- B. 1
- C. -1

D. non -existant

Answer: A



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12. $\lim_{x \rightarrow \infty} \frac{\log x^n - [x]}{[x]}$ where $n \in N$ and $[.]$ denotes the greatest integer function, is

A. 1

B. -1

C. 0

D. none of these

Answer: B



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13. If $a, \lim_{x \rightarrow 1} x^{1/1-x} + b = e^{-1} (a \geq 1, b \geq 0)$, then

A. $a = 1, b = e^{-1}$

B. $a = 2, b = e^{-1}$

C. $a = -1, b = e^{-1}$

D. $a = 1, b = 0$

Answer: D



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14. $\lim_{x \rightarrow -1} \frac{\cos 2 - \cos 2x}{x^2 - |x|}$ is equal to

A. 2

B. $\sin 2$

C. $2 \sin 2$

D. none of these

Answer: C

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15. $\lim_{x \rightarrow \infty} \left(\left(\frac{x}{x+1} \right)^a + \sin\left(\frac{1}{x}\right) \right)^x$ is equal to

A. $e^a - 1$

B. $e^1 - a$

C. e

D. 0

Answer: B

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16. If $\{x\}$ denotes the fractional part of x , then $\lim_{x \rightarrow 0} \frac{\{x\}}{\tan\{x\}}$ is equal to

A. 1

B. 0

C. -1

D. none of these

Answer: D



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17. If $\{x\}$ denotes the fractional part of x , then $\lim_{x \rightarrow 1} \frac{x \sin\{x\}}{x - 1}$, is

A. 0

B. -1

C. non-existent

D. none of these

Answer: C



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18. $\lim_{x \rightarrow 1} \frac{\sin \sqrt{x}}{\sqrt{\sin x}}$ is equal to

A. 0

B. 1

C. -1

D. none of these

Answer: B



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19. If α and β are roots of the equation $ax^2 + bx + c = 0$, then

$\lim_{x \rightarrow \alpha} (1 + ax^2 + bx + c)^{1/x - \alpha}$, is

A. $e^{a(\alpha - \beta)}$

B. $e^{a(\beta - \alpha)}$

C. 1

D. none of these

Answer: A



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20. If $f(x) = \frac{1}{3} \left\{ f(x+1) + \frac{5}{f(x+2)} \right\}$ and $f(x) > 0$ for all $x \in \mathbb{R}$,

then $\lim_{x \rightarrow \infty} f(x)$ is

A. $\sqrt{\frac{2}{5}}$

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

C. ∞

D. none of these

Answer: B



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21. The value of $(\lim)_{x \rightarrow 0} \left(\left[\frac{100x}{\sin x} \right] + \left[\frac{99 \sin x}{x} \right] \right)$ (where $[.]$ represents the greatest integral function) is 199 (b) 198 (c) 0 (d) none of these

A. 199

B. 198

C. 0

D. none of these

Answer: B



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22. If $\left\{ \frac{\sin\{\cos x\}}{x - \frac{\pi}{2}}, x \neq \frac{\pi}{2} \right\}$ and $1, x = \frac{\pi}{2}$, where $\{\cdot\}$ represents the fractional part function, then $f(x)$ is

A. -1

B. 1

C. non-existent

D. none of these

Answer: C



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23. The value of $\lim_{x \rightarrow \infty} 1 + \frac{1}{(x^n)^x}, n > 0$, is

A. 1, if $n < 1$

B. 1, if $n > 1$

C. e , if $n > 1$

D. e , if $n < 1$

Answer: B



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

A. $a^2 - 3$

B. $a^2 - 1$

C. a^2

D. none of these

Answer: C

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25. $\lim_{x \rightarrow \infty} \frac{n^p \sin^2(n!)}{n+1}$, $0 < p < 1$, is equal to

A. 0

B. ∞

C. 1

D. none of these

Answer: A



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26. If $\lim_{x \rightarrow 0} (\cos x + a \sin bx)^{1/x} = e^2$, then the values of a and b are

A. $a = 1, b = -2$

B. $a = 2\sqrt{2}, b = \sqrt{2}$

C. $a = 2\sqrt{2}, b = \frac{1}{\sqrt[4]{2}}$

D. $a = -2, b = 1$

Answer: C



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27. $\lim_{x \rightarrow 2} \frac{\sum_{r=1}^n x^r - \sum_{r=1}^n 2^r}{x - 2}$ is equal to

A. n

B. $(n - 1)2^n$

C. $(n - 1)2^n + 1$

D. none of these

Answer: C



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28. If α is a repeated root of $ax^2 + bx + c = 0$, then

$\lim_{x \rightarrow \alpha} \frac{\sin(ax^2 + bx + c)}{(x - \alpha)^2}$ is equal to

A. 0

B. a

C. b

D. c

Answer: B



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29. If $f(x) = \begin{cases} \frac{\tan^{-1}(x + [x])}{[x] - 2x} [x] \neq 0 \\ 0 [x] = 0 \end{cases}$ where $[x]$ denotes the greatest

integer less than or equal to x , then $\lim_{x \rightarrow 0} f(x)$ is

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

B. 1

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

D. non-existent

Answer: D



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30. If $[.]$ denotes the greatest integer function, then

$\lim_{x \rightarrow 0} \frac{\tan([- 2\pi^2] x^2) - x^2 \tan[- 2\pi^2]}{\sin^2 x}$ is equal to

A. $20 + \tan 20$

B. $20 + \tan 20$

C. 20

D. none of these

Answer: A



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31. The value of $\lim_{x \rightarrow \infty} \left\{ \frac{x^4 \sin\left(\frac{1}{x}\right) + x^2}{1 + |x^3|} \right\}$ is

A. 1

B. -1

C. 0

D. ∞

Answer: B



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32. _____ if $|x| < 1$ then

$$\lim_{n \rightarrow \infty} (1+x)(1+x^2)(1+x^4)\dots\dots\dots(1+x^{2n}) =$$

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

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

C. $1-x$

D. $x-1$

Answer: B



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33. If $\phi(x) = \lim_{x \rightarrow \infty} \frac{x^{2n}(f(x) + g(x))}{1 + x^{2n}}$ then which of the following is correct

A. $\phi(x) = g(x)$ for all $x \in R$

B. $\phi(x) = f(x)$ for all $x \in R$

C. $\phi x = \begin{cases} g(x) & \text{for } -1 < x < 1 \\ f(x) & \text{for } |x| \geq 1 \end{cases}$

D. $\phi x = \begin{cases} g(x) & \text{for } |x| < 1 \\ f(x) & \text{for } |x| > 1 \\ \frac{f(x) + g(x)}{2} & \text{for } |x| = 1 \end{cases}$

Answer: D



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34. The value of

$$\lim_{x \rightarrow \pi/2} \left\{ 1^{\sec^2 x} + 2^{\sec^2 x} + 3^{\sec^2 x} + \dots + n^{\sec^2 x} \right\}^{\cos^2 x} \text{ is}$$

A. 0

B. n

C. ∞

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

Answer: B





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35. If $l = \lim_{x \rightarrow 0} \frac{\tan x^n}{(\tan x)^m}$, where $m, n \in \mathbb{N}$, then

A. $l = 1$ for all $m, n \in \mathbb{N}$

B. $l = \begin{cases} 1 & \text{if } n > m \\ 0 & \text{if } n < m \end{cases}$

C. $l = \begin{cases} 1 & \text{if } n = m \\ 0 & \text{if } n > m \end{cases}$

D. $l = 0$ for all $m, n \in \mathbb{N}$

Answer: C



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36. If $\lim_{x \rightarrow \infty} \frac{(1 + a^3) + 8e^{\frac{1}{x}}}{1 + (1 - b^3)e^{\frac{1}{x}}} = 2$, then there exists

A. $a = 1, b = (-3)^{1/3}$

B. $a = 1, b = 3^{1/3}$

C. $a = -1, b = -(3)^{1/3}$

D. none of these

Answer: A

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37. $\lim_{x \rightarrow -1} \left(\frac{x^4 + x^2 + x + 1}{x^2 - x + 1} \right)^{\frac{1 - \cos(x+1)}{(x+1)^2}}$ is equal to

A. 1

B. $\sqrt{2/3}$

C. $\sqrt{3/2}$

D. $e^{1/2}$

Answer: B

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38. $\lim_{x \rightarrow e} \frac{\log_e x - 1}{|x - e|}$ is

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

B. $-\frac{1}{e}$

C. e

D. none -existent

Answer: D

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39. $\lim_{x \rightarrow \infty} \frac{1}{n} \left\{ 1 + e^{1/n} + e^{2/n} + e^{3/n} + \dots + e^{\frac{n-1}{n}} \right\}$ is equal to

A. e

B. $-e$

C. $e - 1$

D. $1 - e$

Answer: C

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40. If the graph of the function $y = f(x)$ has a unique tangent at the point $(a, 0)$ through which the graph passes, then evaluate

$$(\lim)_{x \rightarrow a} \frac{(\log)_e \{1 + 6f(x)\}}{3f(x)}$$

A. 1

B. 0

C. 2

D. none of these

Answer: C



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41. $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$, then is the value of

$$\lim_{h \rightarrow 0} \frac{f(1-h) - f(1)}{h^3 + 3h} \text{ is}$$

A. $\frac{53}{3}$

B. $\frac{22}{3}$

C. 13

D. none of these

Answer: A

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42. Let $a = \min \{x^2 + 2x + 3, x \in R\}$ and $b = \lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta^2}$ then the value of $\sum_{r=0}^n a^r \cdot b^{n-r}$ is :

A. $\frac{2^{n+1} - 1}{3 \times 2^n}$

B. $\frac{2^{n+1} + 1}{3 \times 2^n}$

C. $\frac{4^{n+1} - 1}{3 \times 2^n}$

D. none of these

Answer: C

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43. $\lim_{n \rightarrow \infty} \left\{ \frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots + \frac{1}{(2n+1)(2n+3)} \right\}$ is equal to

A. 1

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

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

D. none of these

Answer: B



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44. $\lim_{x \rightarrow 0} \frac{\sin(\sin x) - \sin x}{ax^3 + bx^5 + c} = -\frac{1}{12}$ then

A. $a = 2, b \in R, c = 0$

B. $a = -2, b \in R, c = 0$

C. $a = 1, b \in R, c = 0$

$$D. a = -1, b \in \mathbb{R}, c = 0$$

Answer: A



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45. $\lim_{x \rightarrow 0^-} \frac{[x] + [x^2] + [x^3] + \dots + [x^{2n+1}] + n + 1}{1 + [x^2] + |x| + 2x}, n \in \mathbb{N}$ is equal to

A. $n + 1$

B. n

C. 1

D. 0

Answer: D



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46. $\lim_{x \rightarrow \alpha} (\tan x \cot \alpha)^{\frac{1}{x-\alpha}}$ is equal to

A. $2 \cos ec2\alpha$

B. $\frac{1}{2} \sin 2\alpha$

C. $-2 \cos ec2\alpha$

D. none of these

Answer: D

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47.

$$\lim_{x \rightarrow a} \left\{ \left[\frac{a^{\frac{1}{2}} + x^{\frac{1}{2}}}{a^{\frac{1}{4}} - x^{\frac{1}{4}}} \right]^{-1} - \frac{2(ax)^{\frac{1}{4}}}{x^{\frac{3}{4}} - a^{\frac{1}{4}}x^{\frac{1}{2}} + a^{\frac{1}{2}}x^{\frac{1}{4}} - a^{\frac{3}{4}}} \right]^{-1} - \sqrt{2}^{\log_4 a} \right\}^8$$

A. a

B. $a^{3/4}$

C. a^2

D. \sqrt{a}

Answer: C



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48. The value of $\lim_{n \rightarrow \infty} \left\{ \sqrt[3]{n^2 - n^3} + n \right\}$, is

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

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

C. $\frac{2}{3}$

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

Answer: A



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49. Let $f(x) = [x] + [-x]$, where $[x]$ denotes the greatest integer less than or equal to x . Then, for any integer m

- A. $\lim_{x \rightarrow m} f(x) = f(m)$
- B. $\lim_{x \rightarrow m} f(x) \neq f(m)$
- C. $\lim_{x \rightarrow m} f(x)$ does not exist
- D. none of these

Answer: B

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50. If $[.]$ denotes the greatest integer function, then

$\lim_{x \rightarrow 0} \frac{\sin[-\sec^2 x]}{1 + [\cos x]}$ is equal to

- A. $\sin 1$
- B. $-\sin 1$
- C. $\sin 2$
- D. none of these

Answer: D



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51. The value of $\lim_{x \rightarrow 0} \left\{ 1^{\frac{1}{\sin^2 x}} + 2^{\frac{1}{\sin^2 x}} + 3^{\frac{1}{\sin^2 x}} + \dots + n^{\frac{1}{\sin^2 x}} \right\}^{\sin^2 x}$, is

A. ∞

B. 0

C. n

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

Answer: C



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52. $\lim_{x \rightarrow \pi/2} \frac{\left[\frac{x}{2} \right]}{\log_e(\sin x)}$ (where $[.]$ denotes the greatest integer function)

A. does not exist

B. equals 1

C. equals 0

D. equals -1

Answer: C



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53. If $[.]$ denotes the greatest integer function, then $\lim_{x \rightarrow 0} \left[\frac{x^2}{\tan x \sin x} \right]$

, is

A. 0

B. 1

C. -1

D. non-existent

Answer: B



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54. $\lim_{x \rightarrow 0} \left[\frac{100 \tan x \sin x}{x^2} \right]$ is (where $[.]$ represents greatest integer function).

A. 99

B. 100

C. 0

D. non-existent

Answer: A



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55. $\lim_{x \rightarrow \infty} \left(\frac{1^2}{1-x^3} + \frac{3}{1+x^2} + \frac{5^2}{1-x^3} + \frac{7}{1+x^2} + \dots \right)$ is equal to

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

B. $-\frac{10}{3}$

C. $\frac{5}{6}$

D. none of these

Answer: B



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56. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & 1 \end{vmatrix}$ then $\lim_{x \rightarrow 0} \frac{f(x)}{x^2}$ is

A. -1

B. 3

C. 1

D. 0

Answer: C



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57. $\lim_{x \rightarrow 0} \frac{\sin(nx)((a-n)nx - \tan x)}{x^2} = 0$, when n is a non-zero positive integer, then a is equal to

A. 0

B. $\frac{n+1}{n}$

C. n

D. $n + \frac{1}{n}$

Answer: D



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58. The value of $\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \sec^2 t dt}{x \sin x} dx$, is

A. 0

B. 3

C. 2

D. 1

Answer: D



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59. Let the sequence $\{b_n\}$ satisfy the recurrence relation $b_{n+1} = \frac{1}{3}(2b_n + (125)^{1/n})$, $b_1 = 0$. Then $\lim_{n \rightarrow \infty} b_n$ is

- A. 0
- B. ∞
- C. 5
- D. $2/3$

Answer: C



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60. For $x > 0$, $\lim_{x \rightarrow 0} \left\{ (\sin x)^{1/x} + \left(\frac{1}{x}\right)^{\sin x} \right\}$, is

- A. 0

B. -1

C. 1

D. 2

Answer: C



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61. Find the value of α so that $(\lim)_{x \rightarrow 0} \frac{1}{x^2} (e^{\alpha x} - e^x - x) = \frac{3}{2}$

A. 1

B. 0

C. 4

D. 2

Answer: D



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62. $\lim_{x \rightarrow 0} x^8 \left[\frac{1}{x^3} \right]$, where $[\cdot]$, denotes the greatest integer function is

A. a non-zero positive real number

B. a negative real number

C. 0

D. non-existent

Answer: C

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63. Let $f: R \rightarrow R$ be a positive increasing function with

$$\lim_{x \rightarrow \infty} \frac{f(3x)}{f(x)} = 1 \text{ then } \lim_{x \rightarrow \infty} \frac{f(2x)}{f(x)} =$$

A. $3/2$

B. 3

C. 1

Answer: C[Watch Video Solution](#)

64. Let $f: \mathbb{R} \rightarrow [0, \infty)$ be such that $\lim_{x \rightarrow 5} f(x)$ exists and

$$\lim_{x \rightarrow 5} \frac{(f(x))^2 - 9}{\sqrt{|x - 5|}} = 0 \text{ then } \lim_{x \rightarrow 5} f(x) =$$

A. 1

B. 2

C. 3

D. 0

Answer: C[Watch Video Solution](#)

65.

Let

$$f(\theta) = \frac{1}{\tan^9 \theta} \left\{ (1 + \tan \theta)^{10} + (2 + \tan \theta)^{10} + \dots + (20 + \tan \theta)^{10} \right\} - 20$$

The left hand limit of $f(\theta)$ as $\theta \rightarrow \frac{\pi}{2}$, is

A. 1900

B. 2000

C. 2100

D. 2200

Answer: C
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66. $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$, then is the value of

$$\lim_{h \rightarrow 0} \frac{f(1-h) - f(1)}{h^3 + 3h} \text{ is}$$

A. $\frac{-55}{3}$

B. $\frac{53}{3}$

C. $-\frac{53}{3}$

D. $\frac{55}{3}$

Answer: B



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67. The largest value of non negative integer for which

$$\lim_{x \rightarrow 1} \left(\frac{-ax + \sin(x-1) + a}{x + \sin(x-1) - 1} \right)^{\frac{1-x}{1-\sqrt{x}}} = \frac{1}{4}$$

A. 2

B. 3

C. 4

D. 5

Answer: A



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68. Let m and n be two positive integers greater than 1. If

$$\lim_{\alpha \rightarrow 0} \frac{e^{\cos \alpha^n} - e}{\alpha^m} = -\left(\frac{e}{2}\right) \text{ then the value of } \frac{m}{n} \text{ is}$$

A. 2

B. 4

C. 6

D. 9

Answer: A



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69. $\lim_{x \rightarrow \infty} \left\{ 3\sqrt{(x+a)(x+b)(x+c)} - x \right\} =$

A. \sqrt{abc}

B. $\frac{a+b+c}{3}$

C. abc

D. $(abc)^{\frac{1}{3}}$

Answer: B



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70. $(\lim)_{x \rightarrow \infty} \left\{ \left(\frac{n}{n+1} \right)^\alpha + s \in \frac{1}{n} \right\}^n$ (when $\alpha \in \mathbb{Q}$) is equal to $e^{-\alpha}$ (b) $-\alpha$ (c) $e^{1-\alpha}$ (d) $e^{1+\alpha}$

A. e^α

B. $-\alpha$

C. $e^1 - \alpha$

D. $e^1 + \alpha$

Answer: C



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71. The value of $\lim_{n \rightarrow \infty} \frac{1^2 \cdot n + 2^2 \cdot (n-1) + \dots + n^2 \cdot 1}{1^3 + 2^3 + \dots + n^3}$ is equal to

A. $1/3$

B. $2/3$

C. $1/2$

D. $1/6$

Answer: A



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72. $\lim_{x \rightarrow \infty} \left(\frac{n\sqrt{a} + n\sqrt{b}}{2} \right)^n, a, b, > 0$ equals

A. 1

B. \sqrt{ab}

C. ab

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

Answer: B



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73. $\lim_{x \rightarrow \infty} \frac{\cot^{-1}(\sqrt{x+1} - \sqrt{x})}{\sec^{-1}\left\{\left(\frac{2x+1}{x-1}\right)^x\right\}}$ is equal to

A. 1

B. 0

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

D. non-existent

Answer: A



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74. $\lim_{x \rightarrow \infty} \frac{x^{2^{32}} - 2^{32}x + 4^{16} - 1}{(x-1)^2}$ is equal to

A. $2^{63} - 2^{31}$

B. $2^{64} - 2^{31}$

C. $2^{62} - 2^{31}$

D. $2^{65} - 2^{33}$

Answer: B



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75. The value of $\lim_{x \rightarrow \infty} \left(3\sqrt{x^3 + x^2} - 3\sqrt{x^3 - x^2} \right)$, is

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

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

C. 1

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

Answer: B



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76. If $\lim_{x \rightarrow -1} \frac{\sin(x^3 + bx^2 + cx + d)}{(\sqrt{2+x} - 1)\{\log_e(x+2)\}^2}$ exists and is equal to l , then

$b + d + l$ is equal to

A. 5

B. 6

C. 7

D. 4

Answer: B



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77. If $\lim_{x \rightarrow 1} \frac{ax^2 + bx + c}{(x-1)^2} = 2$, then $\lim_{x \rightarrow 1} \frac{(x-a)(x-b)(x-c)}{x+1}$, is

A. 2

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

C. $\frac{7}{2}$

D. 5

Answer: B



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78. The value of $\lim_{x \rightarrow 0} \frac{\log_e(1+x) - x}{x \left\{ (1+x)^{1/x} - e \right\}}$ equal to

A. e^e

B. e

C. $1/e$

D. 1

Answer: C



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79. The value of $\lim_{x \rightarrow 0} \frac{\sin(\sin x) - \tan(\sin x)}{\sin^3(\sin x)}$, is

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

B. -1

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

D. 1

Answer: A



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80. The value of $\lim_{x \rightarrow \infty} x \left\{ \frac{1}{e} - \left(\frac{x}{x+1} \right)^x \right\}$, is

A. $-\frac{e}{2}$

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

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

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

Answer: C



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81. The value of $\lim_{x \rightarrow 1} \left\{ \frac{x^n - 1}{n(x - 1)} \right\}^{\frac{1}{x-1}}$, is

A. $e^{1/2}$

B. $e^{\frac{n}{x-1}}$

C. $e^{\frac{n-1}{2}}$

D. $e^{\frac{n+1}{2}}$

Answer: C



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82. If the normal to differentiable curve $y = f(x)$ at $x = 0$ be given by the equation $3x - y + 3 = 0$, then the value of $\lim_{x \rightarrow 0} \frac{x^2}{f(x^2) - 5f(4x^2) + 4f(7x^2)}$ is

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

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

C. $-\frac{1}{5}$

D. $\frac{1}{4}$

Answer: B



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83. If $\lim_{x \rightarrow 1} \frac{(a \sin(x - 1) + b \cos(x - 1) + 4)}{x^2 - 1} = 2$, then (a, b) is equal

to

A. $(2, 3)$

B. $(a, -4), a \in R$

C. $(3, -b), b \in R$

D. $(4, -4)$

Answer: D



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84. If $a > 0$ and $\lim_{x \rightarrow \infty} \left\{ \sqrt{x^2 + x + 1} - (ax + b) \right\} = 0$, then (a, b) lies on the line.

A. $x - y + 3 = 0$

B. $3x + 4y - 5 = 0$

C. $x + 6y + 2 = 0$

D. $x + 2y + 3 = 0$

Answer: B



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85. If α, β are two distinct real roots of the equation $ax^3 + x - 1 - a = 0$ ($a \neq -1, 0$), none of which is equal to unity. If the value of $\lim_{x \rightarrow \frac{1}{\alpha}} \frac{(1+a)x^3 - x^2 - a}{(e^{1-\alpha x} - 1)(x-1)}$ is $\frac{al(k\alpha - \beta)}{\alpha}$ the value of $k + l$

A. 1

B. 2

C. 3

D. 4

Answer: A



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86. Let $f(x) = \frac{\log_e(x^2 + e^x)}{\log_e(x^4 + e^2x)}$. If $\lim_{x \rightarrow \infty} f(x) = l$ and

$\lim_{x \rightarrow -\infty} f(x) = m$, then

A. $l = m$

B. $l = 2m$

C. $2l = m$

D. $l + m = 0$

Answer: A



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87. $\lim_{x \rightarrow \infty} \left(\frac{n\sqrt{a} + n\sqrt{b}}{2} \right)^n$, $a, b, > 0$ equals

A. 1

B. \sqrt{pq}

C. pq

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

Answer: B



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88. The value of $\lim_{x \rightarrow 0} \frac{e^x - \cos 2x - x}{x^2}$, is

A. 2

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

C. $\frac{3}{2}$

D. $\frac{5}{2}$

Answer: D



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89. $\lim_{x \rightarrow 0} \frac{2^{|x|} e^{|x|} - |x| \log_2 2 - 1}{x \tan x}$ is equal to

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

B. $(\ln 2)^2 + \frac{1}{2} + \frac{1}{2}(\ln 2) + 1$

C. $(\ln 2)^2 + (\ln 2) + \frac{1}{2}$

D. $\frac{1}{2}(\ln 2)^2 + (\ln 2) + \frac{1}{2}$

Answer: D



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90. If $\lim_{x \rightarrow \infty} \frac{f(x)}{n(x-2)^n + n \cdot 3^{n+1} - 3^n} = \frac{1}{3}$, then the range of x is (where $n \in \mathbb{N}$). (a) (2,5) (b) (1,5) (c) $[-5, 5)$ (d) $(-\infty, \infty)$

A. 3

B. 4

C. 5

D. infinite

Answer: C



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91. The value of

$$\lim_{x \rightarrow \infty} \frac{2x^{1/2} + 3x^{1/3} + 4x^{1/4} + \dots + nx^{1/n}}{(2x-3)^{1/2} + (2x-3)^{1/3} + \dots + (2x-3)^{1/n}}$$
 is

A. 0

B. 2

C. $\sqrt{2}$

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

Answer: C



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92. If A, B, C are positive real numbers such that

$\lim_{x \rightarrow \infty} \left(\sqrt{Ax^2 + Bx} - Cx \right) = 2$, then $\frac{BC}{A}$ equals

A. 4

B. 2

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

D. `

Answer: A



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93. Let $k > 0$ and $\lambda = \lim_{x \rightarrow 0} \frac{k(1 - 4\sqrt{k^2 - x^2})}{x^2\sqrt{k^2 - x^2}}$ be finite. Then the value of λk , is

- A. $\lambda = 8, k = \frac{1}{2}$
- B. $\lambda = 8, k = \frac{1}{4}$
- C. $\lambda = 4, k = \frac{1}{2}$
- D. $6\lambda = 4, k = \frac{1}{4}$

Answer: B



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94. If $f(x) = 0$ is a quadratic equation such that $f(-\pi) = f(\pi) = 0$ and $f\left(\frac{\pi}{2}\right) = -\frac{3\pi^2}{4}$, then $(\lim)_{x \rightarrow \pi} \frac{f(x)}{\sin(\sin x)}$ is equal to 0 (b) π (c) 2π (d) none of these

A. 0

B. π

C. 2π

D. none of these

Answer: C



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95. If $(\lim)_{x \rightarrow 0} \frac{x^n - \sin x^n}{x - \sin^n x}$ is non-zero finite, then n must be equal to 4

(b) 1 (c) 2 (d) 3

A. 1

B. 2

C. 3

D. none of these

Answer: B



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96. If $\lim_{x \rightarrow \infty} (8x^3 + mx^2)^{1/3} - nx$ exists and is equal to 1, then the value of $\frac{m}{n}$ is

A. $\frac{1}{6}$

B. 6

C. 3

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

Answer: B



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97. If $P(x)$ is a polynomial such that $P(x) + P(2x) = 5x^2 - 18$, then

$\lim_{x \rightarrow 3} \frac{P(x)}{x - 3}$, is

A. 6

B. 9

C. 18

D. 0

Answer: A



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98. If $f(x) = \lim_{n \rightarrow \infty} \sum_{r=0}^n \frac{\tan\left(\frac{x}{2^{r+1}}\right) + \tan^3\left(\frac{x}{2^{r+1}}\right)}{1 - \tan^2\left(\frac{x}{2^{r+1}}\right)}$ then $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is

A. 1

B. 0

C. -1

D. none of these

Answer: A



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99. Let $f(x)$ be a polynomial satisfying $(f(\alpha))^2 + (f'(\alpha))^2 = 0$. Then

$\lim_{x \rightarrow \alpha} \frac{f(x)}{f'(x)} \left[\frac{f'(x)}{f(x)} \right]$ is equal to (Here $[\cdot]$ denotes the greatest integer function).

A. 0

B. 1

C. -1

D. $f(\alpha)f'(\alpha)$

Answer: B



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100. If $\left| \frac{\cos^{-1}(1)}{n} \right| < \frac{\pi}{2}$, then

$$\lim_{n \rightarrow \infty} \left\{ (n+1) \frac{2}{\pi} \cos^{-1} \cdot \frac{1}{n} - n \right\}$$

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

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

C. 1

D. 0

Answer: B



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101. Let $f(x) = \begin{cases} \frac{\tan^2 [x]}{x^2 - [x]^2} & \text{for } x > 0 \\ 1 & \text{for } x = 0 \\ \frac{1}{\sqrt{|x|} \cot |x|} & \text{for } x < 0 \end{cases}$ where $[x]$ and $\{x\}$ denote

respectively the greatest integer less than equal to x and the fractional part of x , then

A. $\lim_{x \rightarrow 0^+} f(x) = 1$

B. $\lim_{x \rightarrow 0^-} f(x) = 1$

C. $\cot^{-1} \left\{ \lim_{x \rightarrow 0^-} f(x) \right\}^2 = \frac{\pi}{4}$

D. All of these

Answer: D



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Section II - Assertion Reason Type

1. Statement -1 : $\lim_{x \rightarrow \alpha} \frac{\sqrt{1 - \cos 2(x - \alpha)}}{x - \alpha}$ does not exist.

Statement-2 : $\lim_{x \rightarrow 0} \frac{|\sin x|}{x}$ does not exist.

- A. Statement -1 is true, Statement-2 is true,, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is true, Statement-2 is true, Statement-2 is not a correct explanation for statement -1.
- C. Statement-1 is true, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is true.

Answer: A



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2. Statement -1: $\lim_{x \rightarrow \pi/2} \frac{\cot x - \cos x}{2x - \pi^3} = \frac{1}{16}$ statement 2

$\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3} = \frac{1}{2}$

A. Statement -1 is true, Statement-2 is true,, Statement-2 is a correct explanation for Statement-1.

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

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

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

Answer: A



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3. Statement -1: If a and b are positive real numbers and $[\cdot]$ denotes the greatest integer function , then

A. Statement -1 is true, Statement-2 is true,, Statement-2 is a correct explanation for Statement-1.

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

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

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

Answer: A



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4. Statement-1 :

$$\lim_{x \rightarrow \infty} \frac{(x + 1)^{10} + (x + 2)^{10} + \dots + (x + 100)^{10}}{x^{10} + 9^{10}}$$

Statement -2 : If $f(x)$ and $g(x)$ are polynomials of same degree, then

$$\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = \frac{\text{Coefficient of leading term in } f(x)}{\text{Coefficient of leading term in } g(x)}$$

A. Statement -1 is true, Statement-2 is true,, Statement-2 is a correct explanation for Statement-1.

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

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

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

Answer: A



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5. Statement-1: $\lim_{x \rightarrow \infty} \left(\frac{\cos(\pi)}{x} \right)^x = 1$

Statement-2: $\lim_{x \rightarrow \infty} -\pi \tan. \frac{\pi}{x} = 0$

A. Statement -1 is true, Statement-2 is true,, Statement-2 is a correct explanation for Statement-1.

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

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

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

Answer: B

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Exercise

1. $\lim_{x \rightarrow \infty} \left(\sqrt{x^2 + 2x - 1} - x \right) =$

A. ∞

B. $1/2$

C. 4

D. 1

Answer: D

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2. If $l_1 = \lim_{x \rightarrow -2} (x + |x|)$, $l_2 = \lim_{x \rightarrow -2} (2x + |x|)$ and $l_3 = \lim_{x \rightarrow \pi/2} \frac{\cos x}{x - \pi/2}$, then

A. $l_1 < l_2 < l_3$

B. $l_2 < l_3 < l_1$

C. $l_3 > l_2 > l_1$

D. $l_1 < l_3 < l_2$

Answer: B

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3. $\lim_{x \rightarrow \infty} x^{\frac{3}{2}} \left(\sqrt{x^3 + 1} - \sqrt{x^3 - 1} \right)$

A. 1

B. -1

C. 0

D. none of these

Answer: A



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4. $\lim_{x \rightarrow 0} x^2 \sin. \frac{\pi}{x}$, is

A. 1

B. 0

C. non-existent

D. ∞

Answer: B



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5.

$$\lim_{x \rightarrow 2} \left(\left(\frac{x^3 - 4x}{x^3 - 8} \right)^{-1} - \left(\frac{x + \sqrt{2x}}{x - 2} - \frac{\sqrt{2}}{\sqrt{x} - \sqrt{2}} \right)^{-1} \right) \text{ is equal to } < 0$$

$\frac{1}{2}$ (b) 2 (c) 1 (d) none of these

A. $1/2$

B. 2

C. 1

D. none of these

Answer: A



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6. Let $L = \lim_{x \rightarrow 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4}$, $a > 0$. If $L \in \mathbb{R}$, then $a = 2$

(b) $a = 1$ (c) $L = \frac{1}{64}$ (d) $L = \frac{1}{32}$

A. $a = 2, L = \frac{1}{64}$

B. $a = 1, L = \frac{1}{64}$

C. $A = 3, L = \frac{1}{32}$

D. $a = 1, L = \frac{1}{32}$

Answer: A

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7. If $\lim_{x \rightarrow \infty} \left\{ \frac{x^3 + 1}{x^2 + 1} - (ax + b) \right\} = 2$, then

A. $a = 1, b = 1$

B. $a = 1, b = 2$

C. $a = 1, b = -2$

D. none of these

Answer: C

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8. $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 1} - 3\sqrt{x^2 + 1}}{4\sqrt{x^4 + 1} - 5\sqrt{x^4 - 1}}$ is equal to

A. 1

B. 0

C. -1

D. none of these

Answer: B



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9. $\lim_{x \rightarrow 0} \frac{e^{x^2} - \cos x}{x^2}$ is equal to

A. $3/2$

B. $1/2$

C. $2/3$

D. none of these

Answer: A



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10. Write the value of $(\lim)_{x \rightarrow -\infty} (3x + \sqrt{9x^2 - x})$

A. $1/3$

B. $1/6$

C. $-1/6$

D. $-1/3$

Answer: B



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11. $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\int_2^{\sec^2 x} f(t) dt}{x^2 - \frac{\pi^2}{16}}$ equals :

A. $\frac{8}{\pi}f(2)$

B. $\frac{2}{\pi}f(2)$

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

D. $4f(2)$

Answer: A



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12. the value of $\lim_{x \rightarrow 2} \frac{2^x + 2^{3-x} - 6}{\sqrt{2^{-x}} - 2^{1-x}}$ is

A. 16

B. 8

C. 4

D. 2

Answer: B



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13. value of $\lim_{x \rightarrow 0} \frac{1 - \cos^3 x}{x \sin x \cdot \cos x}$ is

A. $2/5$

B. $3/5$

C. $3/2$

D. $3/4$

Answer: C



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14. $\lim_{x \rightarrow 1} \frac{\sqrt{1} - \cos 2(x - 1)}{x - 1}$, is

A. exists and it equals $\sqrt{2}$

B. exists and it equals $-\sqrt{2}$

C. does not exist because $(x - 1) \rightarrow 0$

D. does not exist because left hand limit is not equal to right hand limit

Answer: D



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15. 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

A. $\frac{1}{10}$

B. $\frac{1}{11}$

C. $\frac{1}{120}$

D. $\frac{1}{8}$

Answer: C



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16. The value of $\lim_{x \rightarrow 0} \frac{1 - \cos(1 - \cos x)}{x^4}$ is equal to

A. (1)(8)

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

C. $\frac{1}{4}$

D. none of these

Answer: A



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

A. $\frac{1}{5}$

B. $\frac{1}{6}$

C. $\frac{1}{4}$

D. (1/2)

Answer: B



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18. The value of $\lim_{x \rightarrow 1} (2 - x)^{\tan \cdot \frac{\pi x}{2}}$ is equal to

A. $e^{-2/\pi}$

B. $e^{1/\pi}$

C. $e^{2/\pi}$

D. $e^{-1/\pi}$

Answer: C



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19. The value of $\lim_{x \rightarrow \infty} \left(\frac{3x - 4}{3x + 2} \right)^{\left(\frac{x+1}{3} \right)}$ is

A. $e^{-2/3}$

B. $e^{-1/3}$

C. e^{-2}

D. e^{-1}

Answer: A



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20. $\lim_{x \rightarrow \infty} \left(\frac{x^2 - 2x + 1}{x^2 - 4x + 2} \right)^x$ is equal to

A. e^2

B. e^{-2}

C. e^6

D. none of these

Answer: A



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21. The value of $\lim_{x \rightarrow 0} \left(\frac{1 + \tan x}{1 + \sin x} \right)^{\cos ecx}$, is

A. 1

B. exists and it equals $-\sqrt{2}$

C. e^{-1}

D. none of these

Answer: A



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22. $\lim_{x \rightarrow 0} \left(\frac{5x^2 + 1}{3x^2 + 1} \right)^{1/x^2}$

A. e^2

B. e

C. e^{-1}

D. none of these

Answer: A



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23. The value of $\lim_{x \rightarrow \infty} x \left[\tan^{-1} \left(\frac{x+1}{x+2} \right) - \tan^{-1} \left(\frac{x}{x+2} \right) \right]$ is

A. 1

B. -1

C. $1/2$

D. $-1/2$

Answer: C



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24. The value of $\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \cos t^2 dt}{x \sin x}$ is

A. $3/2$

B. 1

C. -1

D. none of these

Answer: B



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25. The value of $\lim_{h \rightarrow 0} \frac{\ln(1 + 2h) - 2\ln(1 + h)}{h^2}$, is

A. 1

B. -1

C. 0

D. none of these

Answer: B



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26. The value of $\lim_{x \rightarrow 1} (\log_5 5x)^{\log_x 5}$, is

A. 1

B. e

C. -1

D. none of these

Answer: B



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27. The value of $\lim_{x \rightarrow 1} (\log_2 2x)^{\log_x 5}$, is

A. $5/2$

B. $e^{\log 25}$

C. $\log 5 / \log 2$

D. $e^{\log_a r 5^2}$

Answer: B



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28. $\lim_{x \rightarrow 0} \frac{\sin x^n}{(\sin x)^m}, (m < n)$ is equal to

A. 1

B. 0

C. n/m

D. none of these

Answer: B



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29. If $0 < x < y$, then $\lim_{x \rightarrow \infty} (y^n + x^n)^{1/n}$ is equal to

A. e

B. x

C. y

D. none of these

Answer: C



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30. the value of $\lim_{x \rightarrow \infty} \left(\sqrt{a^2 x^2 + ax + 1} - \sqrt{a^2 x^2 + 1} \right)$, ($a > 0$) is

A. $1/2$

B. 1

C. 2

D. none of these

Answer: A



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31. $\lim_{x \rightarrow 1} (1 - x)\tan\left(\frac{\pi x}{2}\right)$ is equal to

A. $\pi/2$

B. $\pi + 2$

C. $2/\pi$

D. none of these

Answer: C



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32. The value of $\lim_{x \rightarrow 0} \frac{x(5^x - 1)}{1 - \cos x}$, is

A. $5 \log 2$

B. $2 \log 5$

C. $\frac{1}{2} \log 5$

D. $\frac{1}{5} \log 2$

Answer: B



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33. If $f(x) = \frac{\sin(e^{x-2} -)}{\log(x - 1)}$ then $\lim_{x \rightarrow 2} f(x)$ is given by

A. -2

B. -1

C. 0

D. 1

Answer: D



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34. The value of $\lim_{x \rightarrow \infty} \left\{ \frac{x^2 \sin\left(\frac{1}{x}\right) - x}{1 - |x|} \right\}$, is

A. 0

B. 1

C. -1

D. none of these

Answer: A

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35. If $f(x) = \left(\frac{x^2 + 5x + 3}{x^2 + x + 2} \right)^x$ then $\lim_{x \rightarrow \infty} f(x)$ is equal to

A. e^4

B. e^3

C. e^2

D. 24

Answer: A

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36. The value of $\lim_{x \rightarrow \infty} a^x \sin\left(\frac{b}{a^x}\right)$ is ($a > 1$)

- A. $\log a$
- B. $a \log b$
- C. b
- D. none of these

Answer: C



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37. The value of $\lim_{x \rightarrow 0} \frac{|x|}{x}$, is

- A. 1
- B. -1
- C. 0

D. none of these

Answer: D



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38. The value of $\lim_{x \rightarrow 0} \frac{\sin x - x + \frac{x^3}{6}}{x^5}$, is

A. 0

B. 1

C. $1/60$

D. $1/120$

Answer: D



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39. The value of $\lim_{x \rightarrow \infty} x^{1/x}$ equals

A. 0

B. 1

C. e

D. e^{-1}

Answer: B

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40. The value of $\lim_{x \rightarrow 0} \frac{1 + \sin x - \cos x + \log(1 - x)}{x^3}$, is

A. $1/2$

B. $-1/2$

C. 0

D. 1

Answer: B

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41. let $f(x) = \lim_{n \rightarrow \infty} \frac{x^{2n} - 1}{x^{2n} + 1}$

A. $f(x) = \begin{cases} 1 & |x| > 1 \\ -1 & |x| < 1 \end{cases}$

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

C. $f(x)$ is not defined for any value of x

D. $f(x) = 1$ for $|x| = 1$

Answer: A



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42. $\lim_{x \rightarrow 0} \frac{x \cos x = \log(1 + x)}{x^2}$ equals

A. $1/2$

B. 0

C. 1

D. $-1/2$

Answer: A



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43. If $f(x) = \sqrt{\frac{x + \sin x}{x - \cos x}}$, then $\lim_{x \rightarrow \infty} f(x)$, is

A. 0

B. ∞

C. 1

D. none of these

Answer: C



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44. $\lim_{x \rightarrow 0} \frac{(1 - \cos 2x) \sin 5x}{x^2 \sin 3x}$

A. $10/3$

B. $3/10$

C. $6/5$

D. $5/6$

Answer: A



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

A. 1

B. e

C. e^2

D. e^3

Answer: B



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46. The value of $\lim_{x \rightarrow \infty} \left(\frac{x+3}{x-1} \right)^{x+1}$ is

A. e

B. e^2

C. e^4

D. $1/e$

Answer: C



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47. The value of $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$, is

A. 1

B. 0

C. -1

D. none of these

Answer: B



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48. The value of $\lim_{x \rightarrow \infty} \left(\frac{x+6}{x+1} \right)^{x+4}$, is

A. e

B. e^2

C. e^4

D. e^5

Answer: D



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49. $\lim_{x \rightarrow 0} \frac{\sin 4x}{1 - \sqrt{1-x}}$, is

A. 4

B. 8

C. 10

D. 2

Answer: B

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50. If $G(x) = -\sqrt{25-x}$. Then $\lim_{x \rightarrow 1} \frac{G(x) - G(1)}{x - 1}$ has the value

A. $\frac{1}{\sqrt{24}}$

B. $\frac{1}{5}$

C. $-\sqrt{24}$

D. $-1/5$

Answer: A

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51. $\lim_{x \rightarrow 0^-} \frac{\sin x}{\sqrt{x}}$ is equal to

A. 0

B. 1

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

D. none of these

Answer: D



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52. $\lim_{n \rightarrow \infty} \left[\frac{1}{1-n^2} + \frac{2}{1-n^2} + \dots + \frac{n}{1-n^2} \right]$ is equal to

A. 0

B. $-1/2$

C. $1/2$

D. 1

Answer: B



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53. $\lim_{x \rightarrow (-1)^+} \frac{\sqrt{\pi} - \sqrt{\cos^{-1} x}}{\sqrt{x + 1}}$ is equal to

A. $\frac{1}{\sqrt{\pi}}$

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

C. 1

D. 0

Answer: B



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54. $\lim_{x \rightarrow \infty} \left\{ 20 \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \sqrt{x + \dots}}}}} \right\}$ is equal to

- A. 0
- B. $1/2$
- C. $\log 2$
- D. e^4

Answer: B

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55. If $f(x) = \lim_{m \rightarrow \infty} \lim_{n \rightarrow \infty} \cos^{2m} n! \pi x$ then the range of $f(x)$ is

- A. 2 or 1 according as x is rational or irrational
- B. 1 or 2 according as x is rational or irrational
- C. 1 for all x
- D. 2 or 1 for all x

Answer: A



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56. $\lim_{x \rightarrow 1} \frac{\sin(e^{x-1} - 1)}{\log x}$ is equal to

A. 1

B. 0

C. e

D. e^{-1}

Answer: A



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57. The value of $\lim_{x \rightarrow \infty} \left(\frac{x-1}{x+1} \right)^x$, is

A. 0

B. e^{-1}

C. e^{-2}

D. e^{-3}

Answer: C



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58. Let $f(x) = \frac{1}{\sqrt{18 - x^2}}$ The value of $\lim_{x \rightarrow 3} \frac{f(x) - f(3)}{x - 3}$ is

A. 0

B. $-1/9$

C. $-1/3$

D. $1/9$

Answer: D



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59. If $f(x) = \frac{2}{x-3}$, $g(x) = \frac{x-3}{x+4}$ and $h(x) = -\frac{2(2x+1)}{x^2+x-12}$, then

find $\lim_{x \rightarrow 3} [f(x) + g(x) + h(x)]$

A. -2

B. -1

C. $-2/7$

D. 0

Answer: C



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60. The value of $\lim_{x \rightarrow 0} \frac{a^x - b^x}{x}$, is

A. $\log(a/b)$

B. $\log(b/a)$

C. $\log(ab)$

D. $-\log(ab)$

Answer: A



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61. The value of $\lim_{x \rightarrow 0} \frac{e^x - (x + x)}{x^2}$, is

A. 0

B. $1/2$

C. 2

D. e

Answer: B



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62. $\lim_{x \rightarrow 1} (1 + \cos \pi x) \cot^2 \pi x$ is equal to

A. 1

B. -1

C. 1/2

D. -1/2

Answer: C



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63. The value of $\lim_{x \rightarrow 0} \frac{\int_0^x t dt}{x \tan(x + \pi)}$ is equal to

A. 0

B. 2

C. 1/2

D. 1

Answer: C



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64. The value of $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 6}{x^2 - 6} \right)^x$ is given by

- A. 0
- B. 1
- C. -1
- D. none of these

Answer: B



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65. If $[x]$ denotes the greatest integer less than or equal to x , then the value of $\lim_{x \rightarrow 1} (1 - x + [x - 1] + [1 - x])$ is

- A. 0
- B. 1

C. -1

D. none of these

Answer: C



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66. Let α and β be the distinct roots of $ax^2 + bx + c = 0$ then

$\lim_{x \rightarrow \alpha} \frac{1 - \cos(ax^2 + bx + c)}{(x - \alpha)^2}$ equal to

A. 0

B. $\frac{1}{2}(\alpha - \beta)^2$

C. $\frac{a^2}{2}(\alpha - \beta)^2$

D. $-\frac{a^2}{2}(\alpha - \beta)^2$

Answer: C



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67. If $f(x) = \begin{cases} x \sin \left(\frac{1}{x} \right) & x \neq 0 \\ 0 & x = 0 \end{cases}$ Then, $\lim_{x \rightarrow 0} f(x)$

- A. is equal to 1
- B. is equal to -1
- C. is equal to 0
- D. does not exist

Answer: C



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68. The value of $\lim_{x \rightarrow -\pi} \frac{|x + \pi|}{\sin x}$

- A. is equal to -1
- B. is equal to 1
- C. is equal to π
- D. does not exist

Answer: D



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69. If $\lim_{x \rightarrow \infty} (\sqrt{x^2 - x + 1} - ax - b) = 0$ then the value of a and b are given by:

A. $a = 1, b = \frac{1}{2}$

B. $a = 1, b = -\frac{1}{2}$

C. $a = -1, b = \frac{1}{2}$

D. none of these

Answer: B



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70. $\lim_{x \rightarrow 1} \frac{\sum_{x=1}^n x^r - n}{x - 1}$ is equal to

A. $\frac{n}{x}$

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

C. 1

D. 0

Answer: B



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71. $\lim_{x \rightarrow \frac{\pi}{4}} \frac{2\sqrt{2} - (\cos x + \sin x)^3}{1 - \sin 2x} =$

A. $\frac{3}{\sqrt{2}}$

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

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

D. $\sqrt{2}$

Answer: A



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72. $\lim_{x \rightarrow -1} \frac{(1+x)(1-x^2)(1+x^3)(1-x^4)\dots\dots(1-x^{4n})}{[(1+x)(1-x^2)(1+x^3)(1-x^4)\dots\dots(1-x^{2n})]^2}$ is equal to

A. ${}^{4n}C_{2n}$

B. ${}^{2n}C_n$

C. $2 \cdot {}^{4n}C_{2n}$

D. $2 \cdot {}^{2n}C_n$

Answer: A



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73. The value of

$$\lim_{n \rightarrow \infty} \frac{1. \sum_{r=1}^n (r) + 2. \sum_{r=1}^{n-1} (r) + 3 \sum_{r=1}^{n-2} (r) + \dots + n.1}{n^4}$$

A. $1/24$

B. $1/12$

C. $1/6$

D. none of these

Answer: A



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74. The value of $\lim_{x \rightarrow \infty} \left\{ \frac{1}{3} + \frac{2}{21} + \frac{3}{91} + \dots + \frac{n}{n^4 + n^2 + 1} \right\}$, is

A. 1

B. $1/2$

C. $1/3$

D. none of these

Answer: B



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75. The value $\lim_{x \rightarrow \pi/2} (\sin x)^{\tan x}$, is

A. 0

B. 1

C. -1

D. ∞

Answer: B



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76. The value of $\lim_{x \rightarrow \infty} \frac{5^{x+1} - 7^{x+1}}{5^x - 7^x}$, is

A. 5

B. -5

C. 7

D. -7

Answer: C



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77. The value of $\lim_{x \rightarrow 3} \frac{3^x - x^3}{x^x - 3^3}$, is

A. $\frac{\log 3 - 1}{\log 3 + 1}$

B. $\frac{\log 3 + 1}{\log 3 - 1}$

C. 1

D. none of these

Answer: A



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78. $\lim_{n \rightarrow \infty} [\log_{n-1}(n) \log_n(n+1) \cdot \log_{n+1}(n+2) \dots \log_{n^k-1}(n^k)]$ is

equal to :

A. ∞

B. n

C. k

D. none of these

Answer: C

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79. The value of $\lim_{n \rightarrow \infty} \left(\cos\left(\frac{x}{n}\right) \right)^n$, is

A. e

B. e^{-1}

C. 1

D. none of these

Answer: C

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80. The value of $\lim_{x \rightarrow \infty} \frac{\sqrt{n^2 + 1} + \sqrt{n}}{4\sqrt{n^4 + n} + 4\sqrt{n}}$, is

A. 0

B. 1

C. -1

D. none of these

Answer: B



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81. The value of $\lim_{x \rightarrow 0} \frac{x^2 \sin\left(\frac{1}{x}\right)}{\sin x}$, is

A. 1

B. 0

C. 1/2

D. none of these

Answer: B



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82. If $l = \lim_{x \rightarrow -2} \frac{\tan \pi x}{x + 2} + \lim_{x \rightarrow \infty} \left(\frac{1 + 1}{(x^2)^2} \right)$, then which one of the following is not correct?

A. $l > 3$

B. $l > 4$

C. $l < 4$

D. l is a transcendental number

Answer: B



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83. $\lim_{n \rightarrow \infty} \left(\sqrt{n^2 + n + 1} - [n^2 + n + 1] \right) (n \in I)$ where $[]$ denote the greatest integer function is

A. 0

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

C. $\frac{2}{3}$

D. $\frac{1}{4}$

Answer: B



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84. The value of $\lim_{n \rightarrow \infty} \frac{1^2 \cdot n + 2^2 \cdot (n-1) + \dots + n^2 \cdot 1}{1^3 + 2^3 + \dots + n^3}$ is equal to

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

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

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

D. $\frac{1}{6}$

Answer: A



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85. The $\lim_{x \rightarrow \infty} \frac{\cot^{-1}(x^{-a} \log_a x)}{\sec^{-1}(a^x \log_x a)}$, $a > 0, a \neq 1$ is equal to

A. 1

B. 0

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

D. does not exist

Answer: A



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86. Let $a = \min \{x^2 + 2x + 3 : x \in R\}$ and $b = \lim_{x \rightarrow 0} \frac{\sin x \cos x}{e^x - e^{-x}}$.

Then the value of $\sum_{r=0}^n a^r, b^{n-r}$, is

A. $\frac{2^{n+1} + 1}{3 \cdot 2^n}$

B. $\frac{2^{n+1} - 1}{3 \cdot 2^n}$

C. $\frac{2^n - 1}{3 \cdot 2^n}$

D. $\frac{4^{n+1} - 1}{3 \cdot 2^n}$

Answer: D



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87. $\lim_{x \rightarrow \infty} \frac{\cot^{-1}(\sqrt{x+1} - \sqrt{x})}{\sec^{-1}\left\{\left(\frac{2x+1}{x-1}\right)^x\right\}}$ is equal to

A. 1

B. 0

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

D. does not exist

Answer: A



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88. Let $f(x) = \lim_{n \rightarrow \infty} \frac{2x^{2n} \sin\left(\frac{1}{x}\right) + x}{1 + x^{2n}}$, then which of the following alternative(s) is/ are correct?

- A. $\lim_{x \rightarrow \infty} x f(x) = 2$
- B. $\lim_{x \rightarrow 1} f(x)$ does not exist
- C. $\lim_{x \rightarrow 0} f(x)$ does not exist
- D. $\lim_{x \rightarrow \infty} f(x)$ is equal to zero

Answer: A::D



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89. Assume that $(\lim)_{\theta \rightarrow 1} f(\theta)$ exists and $\frac{\theta^2 + \theta - 2}{\theta + 3} \leq \frac{f(\theta)}{\theta^2} \leq \frac{\theta^2 + 2\theta - 1}{\theta + 3}$ holds for certain interval containing the point $\theta = -1$ then $(\lim)_{\theta \rightarrow -1} f(\theta)$ is equal to $f(-1)$ b. is equal to 1 c. is non-existent d. is equal to -1

A. equal to $f(-1)$

B. equal to 1

C. non-existent

D. equal to -1

Answer: A



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90. Let f be a function defined on $(-1, 1)$ by

$$f(x) = \frac{\cos^{-1}(1 - \{x\}^2) \sin^{-1}(1 - \{x\})}{(\{x\} - \{x\})^3}, x \neq 0 \text{ and } \{.\} \text{ is the}$$

fractional part function. Which of the following statements is correct ?

- A. $\lim_{x \rightarrow 0^+} f(x)$ exists and equals $\frac{\pi}{\sqrt{2}}$
- B. $\lim_{x \rightarrow 0^-} f(x)$ exists and equals $\frac{\pi}{4}$
- C. $\lim_{x \rightarrow 0^+} f(x)$ exists and equals $\frac{\pi}{4}$
- D. $\lim_{x \rightarrow 0^-} f(x)$ exists and equals $\frac{\pi}{2}$

Answer: A:B

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91. Let $f(x) = \begin{cases} \frac{\tan^2 [x]}{x^2 - [x]^2} & \text{for } x > 0 \\ \frac{1}{\sqrt{|x| \cot |x|}} & \text{for } x < 0 \end{cases}$ where $[x]$ and $\{x\}$ denote

respectively the greatest integer less than equal to x and the fractional part of x , then

- A. $\lim_{x \rightarrow +} f(x) = 1$
- B. $\lim_{x \rightarrow 0^-} f(x) = \cot 1$
- C. $\cot^{-1} \left(\lim_{x \rightarrow 0^-} f(x) \right)^2 = 1$
- D. $\tan^{-1} \left(\lim_{x \rightarrow 0^+} f(x) \right) = \frac{\pi}{4}$

Answer: A::B::D

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

A. 1

B. 2

C. 3

D. 4

Answer: C

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93. The value of $\lim_{x \rightarrow 0} \left[\frac{x^2}{\sin x \tan x} \right]$ (Where $[\cdot]$ denotes greatest integer function) is

A. 0

B. 1

C. limit does not exist

D. -1

Answer: A



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94. If $\lim_{x \rightarrow 0} \frac{x^a \sin^b x}{\sin(x^c)}$, which $a, b, c \in \mathbb{R} - \{0\}$ and, $[\cdot]$ denotes the greatest integer function, then

A. $a + c = b$

B. $b + c = a$

C. $a + b = c$

D. none of these

Answer: C



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95. $\lim_{x \rightarrow 2} \frac{(10 - x)^{1/3} - 2}{x - 2}$ is equal to

A. $\frac{1}{12}$

B. $-\frac{1}{12}$

C. $-\frac{1}{10}$

D. $\frac{1}{10}$

Answer: B



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96. If $L = \lim_{x \rightarrow 0} \frac{a \sin x - bx + cx^2 + x^3}{2x^2 \log(1 + x) - 2x^3 + x^4}$ exists and is finite then $a =$,

$b =$, $c = L =$

A. $\frac{1}{20}$

B. $\frac{2}{45}$

C. $\frac{3}{40}$

D. $\frac{1}{40}$

Answer: C



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97. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then

$\lim_{x \rightarrow \alpha} (ax^2 + bx + c + 1)^{1/x - \alpha}$ is equal to

A. $2a(\alpha - \beta)$

B. $-2 \ln|a(\alpha - \beta)|$

C. $e^{a(\alpha - \beta)}$

D. $e^{a^2}|\alpha - \beta|$

Answer: C



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98. Find the integral value of n for which

$(\lim)_{x \rightarrow 0} \frac{\cos^2 x - \cos x - e^x \cos x + e^x - \frac{x^3}{2}}{x^n}$ is a finite nonzero number

A. 2

B. 3

C. 4

D. 5

Answer: C



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99. The graph of the function $y = f(x)$ has a unique tangent at the point

$(e^a, 0)$ through which the graph passes then

$\lim_{x \rightarrow e^a} \frac{\log_e \{1 + 7f(x)\} - \sin f(x)}{3f(x)}$

A. 1

B. 2

C. 7

D. -2

Answer: B



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Chapter Test

1. Let $f(x) = \begin{cases} x^2 & x \in Z \\ \frac{k(x^2-4)}{2-x} & x \notin Z \end{cases}$ Then, $\lim_{x \rightarrow 2} f(x)$

- A. exists only when $k = 1$
- B. exists for every real k
- C. exists for every real k except $k = 1$
- D. does not exist

Answer: B



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2. If $S_n = \sum_{k=1}^n a_k$ and $\lim_{n \rightarrow \infty} a_n = a$, then $\lim_{n \rightarrow \infty} \frac{S_{n+1} - S_n}{\sqrt{\sum_{k=1}^n k}}$ is equal

to

A. 0

B. a

C. $\sqrt{2}a$

D. 2a

Answer: A



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3. If $a_1 = 1$ and $a_{n+1} = \frac{4 + 3a_n}{3 + 2a_n}$, $n \geq 1$, and if $(\lim)_{n \rightarrow \infty} a_n = a$,

then find the value of a .

A. $\sqrt{2}$

B. $-\sqrt{2}$

C. 2

D. none of these

Answer: A



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4. If $x_1 = 3$ and $x_{n+1} = \sqrt{2 + x_n}$, $n \geq 1$, then $\lim_{n \rightarrow \infty} x_n$ is equal to

A. -1

B. 2

C. $\sqrt{5}$

D. 3

Answer: B



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5. The value of $\lim_{x \rightarrow 0} \frac{\sqrt{1 - \cos x^2}}{1 - \cos x}$, is

A. $1/2$

B. 2

C. $\sqrt{2}$

D. none of these

Answer: C



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6. The value of $\lim_{x \rightarrow \infty} \left(\frac{\pi}{4x}\right) \sin\left(\frac{\pi}{4x}\right)$, is

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

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

C. 1

D. none of these

Answer: B



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7. Evaluate $(\lim)_{n \rightarrow \infty} \left\{ \cos\left(\frac{x}{2}\right) \cos\left(\frac{x}{4}\right) \cos\left(\frac{x}{8}\right) \cos\left(\frac{x}{2^n}\right) \right\}$

A. 1

B. $\frac{\sin x}{x}$

C. $\frac{x}{\sin x}$

D. none of these

Answer: B



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8. If $f(x)$ is the integral of

$\frac{2 \sin x - \sin 2x}{x^3}$, where $x \neq 0$, then find $\lim_{x \rightarrow 0} f'(x)$.

A. 0

B. 1

C. -1

D. 2

Answer: B



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9. The value of $\lim_{x \rightarrow 0^+} x^m (\log x)^n$, $m, n \in N$ is

A. 0

B. m/n

C. mn

D. n/m

Answer: A



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10. The value of $\lim_{x \rightarrow \infty} \frac{\log x}{x^n}, n > 0$, is

A. 0

B. 1

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

D. $\frac{1}{n!}$

Answer: A



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11. The value of $\lim_{x \rightarrow a} \frac{\log(x - a)}{\log(e^x - e^a)}$ is

A. 1

B. -1

C. 0

D. 2

Answer: A



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12. Let $\langle a_n \rangle$ be a sequence such that $\lim_{x \rightarrow \infty} a_n = 0$. Then

$$\lim_{n \rightarrow \infty} \frac{a_1 + a_2 + \dots + a_n}{\sqrt{\sum_{k=1}^n k}}, \text{ is}$$

A. 0

B. 1

C. $\sqrt{2}$

D. 2

Answer: C



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13. Let $\langle a_n \rangle$ be a sequence such that $a_1 = 1$ and $a_n + 1 = \cos a_n, n > 1$. If $a = \lim_{x \rightarrow \infty} a_n$, then a belongs to the interval

A. $(0, \pi/6)$

B. $(\pi/6, \pi/3)$

C. $(\pi/3, \pi/2)$

D. $(\pi/2, 4\pi/3)$

Answer: B



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14. If $f(a) = 2, f'(a) = 1, g(a) = -1, g'(a) = 2$, then the value of

$$\lim_{x \rightarrow a} \frac{g(x)f(a) - g(a)f(x)}{x - a}, \text{ is}$$

A. -5

B. $1/5$

C. 5

D. $-1/5$

Answer: C



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15. If $f(9) = 9$, $f'(9) = 4$, then $(\lim)_{x \rightarrow 9} \frac{\sqrt{f(x) - 3}}{\sqrt{x - 3}} = \text{_____}$.

A. 4

B. 0

C. c

D. 9

Answer: A



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16. If $A_i = \frac{x - a_i}{|x - a_i|}$, $i = 1, 2, \dots, n$ and if $a_1 < a_2 < a_3 < \dots < a_n$.

Then, $\lim_{x \rightarrow a_m} (A_1 A_2 \dots A_n)$, $1 \leq m \leq n$

A. is equal to $(-1)^m$

B. is equal to $(-1)^m + 1$

C. is equal to $(-1)^m - 1$

D. does not exist.

Answer: D



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17. $\lim_{x \rightarrow \infty} \frac{x^n}{e^x} = 0$, (n is an integer) for

A. no value of n

B. all values of n

C. only negative values of n

D. only positive values of n

Answer: B



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18. $\lim_{x \rightarrow 0} \frac{x}{\tan^{-1} x}$ is equal to

A. 0

B. $1/2$

C. 1

D. ∞

Answer: B



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19. If $f(x) = x$, $x < 0$ and $f(x) = 1$, $x = 0$, and $f(x) = x^2$, $x > 0$ then

$\lim_{x \rightarrow 0} f(x)$ is equal to

A. 0

B. 1

C. 2

D. does not exist.

Answer: A



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20. $\lim_{x \rightarrow \infty} \sqrt{\frac{x + \sin x}{x - \cos x}} =$

A. 0

B. 1

C. -1

D. none of these

Answer: B



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21.

Evaluate:

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{a + bx} \right)^{c+dx}, \text{ where } a, b, c, \text{ and } d \text{ are positive}$$

A. $e^{d/b}$

B. $e^{c/a}$

C. $e^{(c+d)/a+b}$

D. e

Answer: A



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22. If $f'(2) = 2$, $f''(2) = 1$, then $\lim_{x \rightarrow 2} \frac{2x^2 - 4f'(x)}{x - 2}$, is

A. 4

B. 0

C. 2

D. ∞

Answer: A



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23. $\lim_{x \rightarrow 0} \frac{e^{\tan x} - e^x}{\tan x - x} =$

A. 1

B. e

C. $e - 1$

D. 0

Answer: A



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24. The value of $\lim_{x \rightarrow 2^-} \{x + (x - [x])^2\}$, is

A. 0

B. 1

C. 2

D. 3

Answer: D



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25. $\lim_{x \rightarrow 0} \left(\frac{e^x + e^{-x} - 2}{x^2} \right)^{1/x^2}$ is equal to

A. $e^{1/2}$

B. $e^1/4$

C. e^1/b

D. 0

Answer: D

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26. The value of $\lim_{x \rightarrow \infty} \left(\frac{\pi}{2} - \tan^{-1} x \right)^{\frac{1}{x^2}}$, is

A. 0

B. 1

C. -1

D. e

Answer: A

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27. The value of $\lim_{x \rightarrow a} \left(\frac{\sin x}{\sin a} \right)^{\frac{1}{x-a}} =$

A. $e^{\sin a}$

B. $e^{\tan a}$

C. $e^{\cot a}$

D. 1

Answer: C



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28. The value of $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 2x + 3}{2x^2 + x + 5} \right)^{\frac{3x+2}{3x+2}}$, is

A. $e^1 / 2$

B. $e^3 / 2$

C. e^3

D. none of these

Answer: D



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29. Evaluate: $\lim_{x \rightarrow \infty} \left\{ \frac{(a_1)^{\frac{1}{x}} + (a_2)^{\frac{1}{x}} + \dots + (a_n)^{\frac{1}{x}}}{n} \right\}^{nx}$

A. $a_1 + a_2 + \dots + a_n$

B. $e^{a_1 + a_2 + \dots + a_n}$

C. $\frac{a_1 + a_2 + \dots + a_n}{n}$

D. $a_1 a_2 \dots a_n$

Answer: D



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30. The value of $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{\frac{\sin x}{x - \sin x}}$, is

A. e^{-1}

B. e

C. 1

D. none of these

Answer: A



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$$31. \lim_{x \rightarrow 1} \left[\frac{x^3 + 2x^2 + x + 1}{x^2 + 2x + 3} \right]^{\frac{1 - \cos(x-1)}{(x-1)^2}}$$

A. e

B. $e^{1/2}$

C. 1

D. none of these

Answer: D



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32. The value of $\lim_{x \rightarrow 0} \frac{\sin x}{x \sqrt[3]{x^2}}$, is

A. 1

B. -1

C. 0

D. none of these

Answer: D



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33. Let $f: R \rightarrow R$ be a differentiable function such that $f(2) = 2$. Then,

the value of $\lim_{x \rightarrow 2} \int_2^{f(x)} \frac{4t^3}{x-2} dt$, is

A. $6f'(2)$

B. $12f'(2)$

C. $32f'(2)$

D. none of these

Answer: C



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34. Let $f''(x)$ be continuous at $x = 0$ and $f''(0) = 4$ then value of

$$\lim_{x \rightarrow 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}$$

A. 11

B. 2

C. 12

D. none of these

Answer: C



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35. Suppose $f: \mathbb{R} \rightarrow \mathbb{R}$ is a differentiable function and $f(1) = 4$. Then value of $\lim_{x \rightarrow 1} \int_4^{f(x)} \frac{2t}{x-1} dt$ is a. $8f'(1)$ b. $4f'(1)$ c. $2f'(1)$ d. $f'(1)$

A. $8f'(1)$

B. $4f'(1)$

C. $2f'(1)$

D. $f'(1)$

Answer: A



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36. Find the value of a and b if $\lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x^3} = 1$

A. $\frac{5}{3}, \frac{3}{2}$

B. $\frac{5}{2}, \frac{3}{2}$

C. $-\frac{5}{2}, \frac{3}{2}$

D. none of these

Answer: C



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37. If $\lim_{x \rightarrow a} \left(\frac{f(x)}{g(x)} \right)$ exists, then

A. both $\lim_{x \rightarrow a} f(x)$ and $\lim_{x \rightarrow a} g(x)$ must exist

B. $\lim_{x \rightarrow a} f(x)$ need not exist but $\lim_{x \rightarrow a} g(x)$ exists

C. neither $\lim_{x \rightarrow a} f(x)$ nor $\lim_{x \rightarrow a} g(x)$ may exist

D. $\lim_{x \rightarrow a} f(x)$ exists but $\lim_{x \rightarrow a} g(x)$ need not exist

Answer: C



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38. Let $f(2) = 4$ and $f'(2) = 4$. Then $\lim_{x \rightarrow 2} \frac{xf(2) - 2f(x)}{x - 2}$ is equal to

A. 2

B. -2

C. -4

D. 3

Answer: C

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39. $\lim_{x \rightarrow 0} \frac{1}{x} \left[\int_{y \rightarrow a} e^{\sin^2 t} dt - \int_{x+y \rightarrow a} e^{\sin^2 t} dt \right]$ is equal to

A. $e^{\sin^2 y}$

B. $\sin 2ye^{\sin^2 y}$

C. 0

D. none of these

Answer: A

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40. $\lim_{x \rightarrow \infty} \frac{\int_0^{2x} x e^{x^2} dx}{e^4 x^2}$

A. 0

B. ∞

C. 2

D. $1/2$

Answer: D



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41. $\lim_{x \rightarrow 0} \frac{3x + |x|}{7x - |x|}$, is

A. 0

B. $1/6$

C. 0

D. does not exist.

Answer: D



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42. Let $\alpha, \beta (\alpha < \beta)$ be the roots of the equation $ax^2 + bx + c = 0$. If

$$\lim_{x \rightarrow \infty} \frac{|ax^2 + bx + c|}{ax^2 + bx + c} = 1 \text{ then}$$

A. $a < 0$ and $\alpha < m < \beta$

B. $a > 0$ and $m > 1$

C. $a > 0$ and $m < 1$

D. all the above

Answer: D



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43. Given that

$$\lim_{n \rightarrow \infty} \sum_{r=1}^n \frac{\log(r+n) - \log n}{n} = 2 \left(\log 2 - \frac{1}{2} \right),$$

$$\lim_{n \rightarrow \infty} \frac{1}{n^k} \left[(n+1)^k (n+2)^k \dots (n+n)^k \right]^{1/n}, \text{ is}$$

A. $\frac{4k}{e}$

B. $k \sqrt{\frac{4}{e}}$

C. $\left(\frac{4}{e}\right)^k$

D. $\left(\frac{e}{4}\right)^k$.

Answer: C



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44. $(\lim)_{x \rightarrow 0} \left(\frac{1^x + 2^x + 3^x + \dots + n^x}{n} \right)^{1/x}$ is equal to $o(n!)^n$ (b) $(n!)^{\frac{1}{n}}$ (c) $n!$ (d) $\ln(n!)$

A. $(n!)^n$

B. $(n!)^{1/n}$

C. $n!$

D. $\ln(n!)$

Answer: B

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45. $\lim_{x \rightarrow 0} \frac{x \tan 2x - 2x \tan x}{(1 - \cos 2x)^2}$, is

A. 2

B. -2

C. $1/2$

D. $-1/2$

Answer: C

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46. If $\lim_{x \rightarrow \infty} \left\{ ax - \frac{x^2 + 1}{x + 1} \right\} = b$, a finite number, then

A. $a = 1, b = 1$

B. $a = 0, b = 1$

C. $a = -1, b = 1$

D. $a = -1, b = -1$

Answer: A



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47. If $f(1) = g(1) = 2$, then $\lim_{x \rightarrow 1} \frac{f(1)g(x) - f(x)g(1) - f(1) + g(1)}{f(x) - g(x)}$

is equal to

A. 0

B. 1

C. 2

D. -2

Answer: D



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48. Let $f(x)$ be twice differentiable function such that $f'(0) = 2$, then,

$$\lim_{x \rightarrow 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}, \text{ is}$$

A. 6

B. 3

C. 12

D. none of these

Answer: A



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49. $\lim_{x \rightarrow \pi/4} \frac{1 - \cot^3 x}{2 - \cot x - \cot^3 x}$, is

A. $\frac{11}{4}$

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

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

D. none of these

Answer: B



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50. $\lim_{x \rightarrow 0} \left\{ \frac{1}{x\sqrt[3]{8+x} - \frac{1}{2x}} \right\}$ is equal to

A. $\frac{1}{12}$

B. $\frac{-4}{3}$

C. $\frac{-16}{3}$

D. $\frac{-1}{48}$

Answer: D



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51. $\lim_{x \rightarrow 0} \frac{1}{x^{12}} \left\{ 1 - \cos\left(\frac{x^2}{2}\right) - \cos\left(\frac{x^4}{4}\right) + \cos\left(\frac{x^2}{2}\right)\cos\left(\frac{x^4}{4}\right) \right\}$ is

equal to

A. $\frac{1}{32}$

B. $\frac{1}{256}$

C. $\frac{1}{16}$

D. $-\frac{1}{256}$

Answer: B



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52. The value of $\lim_{x \rightarrow \infty} \left(\frac{1 + 3x}{2 + 3x} \right)^{\frac{1 - \sqrt{x}}{1 + \sqrt{x}}}$, is

A. 0

B. -1

C. e

D. 1

Answer: D



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53. $\lim_{x \rightarrow \infty} \left(\frac{3x^2 + 2x + 1}{x^2 + x + 2} \right)^{\frac{6x+1}{3x+1}}$, is equal to

A. 3

B. 6

C. 9

D. none of these

Answer: C



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54. The value of $\lim_{x \rightarrow 0} \frac{3\sqrt{1 + \sin x} - 3\sqrt{1 - \sin x}}{x}$, is

A. $\frac{2}{3}$

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

C. $\frac{3}{2}$

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

Answer: A



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55. The value of $\lim_{h \rightarrow 0} \frac{(a + h)^2 \sin(a + h) - a^2 \sin a}{h} =$

A. $2a \sin a + a^2 \cos a$

B. $2a \sin a - a^2 \cos a$

C. $2a \cos a + a^2 \sin a$

D. none of these

Answer: A



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56. $\lim_{h \rightarrow 0} \frac{\sin(a + 3h) - 3 \sin(a + 2h) + 3 \sin(a + h) - \sin a}{h^3} =$

A. $\sin a$

B. $-\sin a$

C. $\cos a$

D. $-\cos a$

Answer: D



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57. If $a = \min \{x^2 + 4x + 5 : x \in R\}$ and $b = \lim_{\theta \rightarrow 0} \frac{1 - \cos 2\theta}{\theta^2}$, then the value of $\sum_{r=0}^n {}^n C_r a^r b^{n-r}$, is

A. $2n$

B. 3^n

C. 3^{n+1}

D. 2^{n-1}

Answer: B



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58. If $\lim_{x \rightarrow 0} \frac{\log(3+x) - \log(3-x)}{x} = k$, the value of k is

A. $-2/3$

B. 0

C. $-1/3$

Answer: D[Watch Video Solution](#)

59. If $f(x) = \begin{cases} \sin x, & x \neq n\pi, n \in \mathbb{Z}, \text{ otherwise} \\ x^2 + 1, & x \neq 0, 4, x = 0 \end{cases}$ and $g(x) = \begin{cases} 5, & x = 2 \end{cases}$ then $(\lim)_{x \rightarrow 0} g\{f(x)\}$ is =

A. 1

B. 5

C. 6

D. 7

Answer: A[Watch Video Solution](#)

60. If $\lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x} = 1$, then a,b, are

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

B. $\frac{5}{2}, \frac{3}{2}$

C. $-\frac{5}{2}, -\frac{3}{2}$

D. none of these

Answer: D



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