



MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

LIMITS AND CONTINUITY

Problems

1. The value that should be assigned to $f(0)$ so that the function

$f(x) = (x + 1)^{\cot x}$ is continuous

A. e

B. 1

C. 2

D. e^{-1}

Answer: A



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2. $\lim_{x \rightarrow 0} \left\{ \tan\left(x + \frac{\pi}{4}\right) \right\}^{1/x}$

A. e^2

B. e

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

D. e^{-1}

Answer: A



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3. If $g(x) = \frac{x}{x}$ for $x > 2$ then $\lim_{x \rightarrow 2} \frac{g(x) - g(2)}{x - 2}$

A. -1

B. 0

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

D. 1

Answer: C



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4. $\lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{2x - \pi}{\cos X} \right) =$

A. 0

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

C. -2

D. 5

Answer: C



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5. If f is defined by $f(x) = \begin{cases} x & \text{for } 0 \leq x < 1 \\ 2 - x & \text{for } x \leq 1 \end{cases}$ then at $x=1$

- A. Continuous and differentiable
- B. Continuous but not differentiable
- C. Discontinuous but differentiable
- D. Neither continuous nor differentiable

Answer: B



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6. $\lim_{x \rightarrow 0} \left(\sqrt{1 + x^2} - \frac{\sqrt{1 - x + x^2}}{3^x - 1} \right)$ is equal to

- A. $\frac{1}{\log_e 3}$
- B. $\log_e 9$
- C. $\frac{1}{\log_e g}$
- D. $\log_e 3$

Answer: C



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7. If $f : [-2, 2] \rightarrow \mathbb{R}$ is defined by

$$f(x) = \begin{cases} \frac{\sqrt{1+cx} - \sqrt{1-cx}}{x} & \text{for } -2 \leq x < 0 \\ \frac{x+3}{x+1} & \text{for } 0 \leq x \leq 2 \end{cases}$$

continuous on $[-2, 2]$ then c is equal to

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

B. 3

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

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

Answer: B



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8. If $f(x) = x \tan^{-1} x$, then $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1}$ equals to

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

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

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

D. $\frac{\pi + 2}{4}$

Answer: D



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9. $\lim_{x \rightarrow 0} \frac{\tan^3 x - \sin^3 x}{x^5}$ is equal to

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

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

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

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

Answer: B



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10. $\lim_{x \rightarrow \infty} \left(\frac{x+6}{x+1} \right)^{x+4}$ is equal to

A. e^4

B. e^6

C. e^5

D. e

Answer: C



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11. Let $F : R \rightarrow R$ be defined by

$$f(x) = \begin{cases} \alpha + \frac{\sin [x]}{x} & \text{if } x > 0 \\ 2 & \text{if } x = 0 \\ \beta + \left[\frac{\sin x - x}{x^3} \right] & \text{if } x < 0 \end{cases}$$

where, $[x]$ denotes the integral part of x . If f continuous at $x = 0$, then

$\beta = \alpha$ is equal to

A. -1

B. 1

C. 0

D. 2

Answer: B



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12. $\lim_{x \rightarrow 8} \left(\frac{\sqrt{1 + \sqrt{1 + x - 2}}}{x - 8} \right)$ is equal to

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

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

C. $\frac{1}{24}$

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

Answer: C

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13. If $[x]$ denotes the greatest integer not exceeding x and if the function

f defined by $f(x) = \begin{cases} \frac{a+2\cos x}{x^2} & x < 0 \\ b \tan \frac{\pi}{x+4} & x \geq 0 \end{cases}$ is continuous at $x = 0$, then

the ordered pair (a,b) is equal to

A. $(-2, 1)$

B. $(-2, -1)$

C. $(-1, \sqrt{3})$

D. $(-2, -\sqrt{3})$

Answer: B



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14. $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^2}$ is equal to

A. 0

B. 1

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

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

Answer: A



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15. If $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \begin{cases} \frac{1 + 3x^2 - \cos 2x}{x^2} & \text{for } x \neq 0 \\ k & \text{for } x = 0 \end{cases}$ is

continuous at $x = 0$, then k is equal to

A. 1

B. 5

C. 6

D. 0

Answer: B



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16. $\lim_{x \rightarrow \infty} \left(\frac{x+5}{x+2} \right)^{x+3}$ equals

A. e

B. e^2

C. e^3

D. e^5

Answer: C



17. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = \begin{cases} \frac{2 \sin x - \sin 2x}{2x \cos x} & \text{if } x \neq 0 \\ a & \text{if } x = 0 \end{cases}$

then the value of 'a' so that f is continuous at 0 is

A. 2

B. 1

C. -1

D. 0

Answer: D



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18. $\lim_{x \rightarrow 0} \frac{1 - e^x \sin x}{x^2 + x^3}$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: C



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19. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = [x - 3] + |x - 4|$ for $x \in \mathbb{R}$

then $\lim_{x \rightarrow 3} f(x)$ is equal to

A. -2

B. -1

C. 0

D. 1

Answer: C



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20. If $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by

$$f(x) = \begin{cases} \frac{\cos 3x - \cos x}{x^2} & \text{for } x \neq 0 \\ \lambda & \text{for } x = 0 \end{cases}$$

and if f is continuous at $x = 0$, then λ is equal to

A. -2

B. -4

C. -6

D. -8

Answer: B



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21. If $f(2) = 4$ and $f'(2) = 1$, then $\lim_{x \rightarrow 2} \frac{xf(2) - 2f(x)}{x - 2}$ is equal to

A. -2

B. 1

C. 2

D. 3

Answer: C



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22. $\lim_{x \rightarrow 0} \left(e^x - \frac{e^{\sin x}}{(x - \sin x)} \right)$ is equal to

A. $-1/2$

B. $1/2$

C. 1

D. $3/2$

Answer: B



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23. if $f(x) = \begin{cases} x - 5 & \text{for } x \leq 1 \\ 4x^2 - 9 & \text{for } 1 < x < 2 \\ 3x + 4 & \text{for } x > 2 \end{cases}$ then $f(2^+)$ is equal to

A. 0

B. 2

C. 3

D. 4

Answer: C



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

when $[x]$ denotes the greatest integer not exceeding x , the $\lim_{x \rightarrow 0} f(x)$ is equal to

A. -1

B. 0

C. 1

D. 2

Answer: B



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25. If $0 < p < 1$

A. e

B. p

C. q

D. 0

Answer: C



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26. $\lim_{x \rightarrow \infty} [\sqrt{x^2 + 2x - 1} - x]$ is equal to

A. ∞

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

C. 4

D. 1

Answer: D



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27. If $\lim_{x \rightarrow 0} \left(\frac{\cos 4x + a \cos 2x + b}{x^4} \right)$ is finite, then the values, of a, b are respectively .

A. 5,-4

B. -5, -4

C. -4, 3

D. 4,5

Answer: C



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28.

If

$$l_1 = \lim_{x \rightarrow 2^+} (x + [x]), l_2 = \lim_{x \rightarrow 2^-} (2x - [x]) \text{ and } l_3 = \lim_{x \rightarrow \pi/2} \frac{\cos x}{x - \pi/2}$$

is

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: C



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29. If $f(x) = \begin{cases} \frac{1 - \sqrt{2}e \sin x}{\pi - 4x} & \text{if } x \neq \frac{\pi}{4} \\ a & \text{if } x = \frac{\pi}{4} \end{cases}$ is continuous at $\pi/4$ then a is equal to

A. 4

B. 2

C. 1

D. $1/4$

Answer: D



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30. $\lim_{x \rightarrow 0} x^2 \sin\left(\frac{\pi}{x}\right)$ is equal to

A. 1

B. 0

C. does not exist

D. ∞

Answer: B



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31. If $f: R \rightarrow R$ is defined by

$$f(x) = \begin{cases} \frac{x-2}{x^2-3x+2} & \text{if } x \in R - \{1, 2\} \\ 2 & \text{if } x = 1 \\ 1 & \text{if } x = 2 \end{cases}$$

A. 0

B. -1

C. 1

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

Answer: B



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32. If $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by

$$f(x) = \begin{cases} \frac{x+2}{x^2+3x+2} & \text{if } x \in \mathbb{R} - \{1, -2\} \\ -1 & \text{if } x = -2 \\ 0 & \text{if } x = -1 \end{cases}$$

then f is continuous on the set

A. \mathbb{R}

B. $\mathbb{R} - \{-2\}$

C. $\mathbb{R} - \{-1\}$

D. $\mathbb{R} - \{-1, -2\}$

Answer: C



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33. The value of $\lim_{n \rightarrow \infty} \frac{1}{n^3} \sum_{k=1}^n (k^2 x)$ is

A. x

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

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

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

Answer: C



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34. If $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x}, & \text{for } -1 \leq x < 0 \\ 2x^2 + 3x - 2, & \text{for } 0 \leq x \leq 1 \end{cases}$

continuous at $x = 0$, then k is equal to

A. -1

B. -2

C. -3

D. -4

Answer: B



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35. If $f(x) = \begin{cases} \frac{x-1}{2x^2-7x+5} & \text{for } x \neq 1 \\ -\frac{1}{3} & \text{for } x = 1 \end{cases}$ then $f(1)$ is equal to

A. $-\frac{1}{9}$

B. $-\frac{2}{9}$

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

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

Answer: B



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36. If $f(x) = \frac{x}{1+|x|}$ for $x \in R$ then $f(0)$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: B



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37. $\lim_{x \rightarrow \frac{\pi}{6}} \left\{ \frac{3 \sin x - \sqrt{3} \cos x}{6x - \pi} \right\}$ is equal to

A. $\sqrt{3}$

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

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

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

Answer: B



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38. If $a > 0$, $\lim_{x \rightarrow a} \frac{a^x - x^a}{x^x - a^a} = -1$ then a is equal to

A. 0

B. 1

C. e

D. 2e

Answer: B



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39. $\lim_{x \rightarrow 0} \frac{4^x - 9^x}{x(4^x + 9^x)}$ is equal to

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

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

C. $\frac{1}{2} \frac{\log 2}{3}$

D. $\frac{1}{2} \frac{\log 2}{3}$

Answer: A



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40. The quadratic equation whose roots are l and m , where

$$l = \lim_{\theta \rightarrow 0} \left(\frac{3 \sin \theta - 4 \sin^2 \theta}{\theta} \right) \text{ and } m = \lim_{\theta \rightarrow 0} \frac{2 \tan \theta}{\theta(1 - \tan^2 \theta)} \text{ is}$$

A. $X^2 + 5x + 6 = 0$

B. $x^2 - 5x + 6 = 0$

C. $x^2 - 5x - 6 = 0$

D. $x^2 + 5x - 6 = 0$

Answer: B



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41. If $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = x - [x]$, where $[x]$, is the greatest integer not exceeding x , then the set of discontinuous of f is

A. The empty set

B. R

C. Z

D. N

Answer: C



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42. If $f: R \rightarrow R$ is defined by

$$f(x) = \begin{cases} a^2 \cos x + b^2 \sin^2 x & x \leq 0 \\ e^{ax+b} & x > 0 \end{cases}$$

is a continuous function, then

A. $b = 2 \log |a|$

B. $2b = \log |a|$

C. $b = \log |2a|$

D. $b^2 = \log |a|$

Answer: A



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

A. 1

B. e^{b-a}

C. e^{a-b}

D. e^b

Answer: A



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44. $\lim_{x \rightarrow 0} \left(\frac{x10^x - x}{1 \cos x} \right)$ is equal to

A. $\log 10$

B. $2 \log 10$

C. $3 \log 10$

D. $4 \log 10$

Answer: B



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45. If $f(x) = \frac{x^2 - 10x + 25}{x^2 - 7x + 10}$ and f is continuous at $x = 5$, then $f(5)$ is equal to

A. 0

B. 5

C. 10

D. 25

Answer: A



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46. $\lim_{x \rightarrow 0} \frac{\sin x \sin^{-1} x}{x^2}$ is equal to

A. 0

B. 1

C. -1

D. ∞

Answer: B



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