MATHS

BOOKS - BITSAT GUIDE

LIMITS CONTINUITY AND DIFFERENTIABILITY

Practice Exercise

1. The value of $\lim_{x \to 2} \frac{2^x + 2^{3-x} - 6}{\sqrt{2^{-x} - 2^{1-x}}}$ is

A. 16

B. 8

C. 4

D. 2

Answer: B

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2. Evaluate

$$\lim_{x \to 0} \frac{\sin(3x + a) - 3\sin(2x + a) + 3\sin(x + a) - \sin a}{x^3}$$

A. 0

B. cos a

C. $-\cos a$

D. sin a

Answer: C

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3. If f(x) = $\frac{\sin[x]}{[x]}$, $[x] \neq 0$ where [x] denotes the greatest integer less than or equal to x, then $\lim_{x \to 0}$ f(x) equals

A. -1

B. 0

C. 1

D. none

Answer: D

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4. $\left(\lim\right)_{x \to 2}\left(\frac{\sqrt{1-\cos\{2(x-2)\}}}{x-2}\right)$ (1) does not exist (2) equals $\sqrt{2}$ (3) equals $-\sqrt{2}$ (4) equals $\frac{1}{\sqrt{2}}$

A. $\sqrt{2}$

B. $-\sqrt{2}$

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

D. Does not exist

Answer: D

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5. The value of $\lim_{x \to 0} \frac{1}{x}\left[\tan^{-1}\left(\frac{x+1}{2x+1}\right) - \frac{\pi}{4}\right]$ is

A. 1

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

C. 2

D. 0

Answer: B

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6. $(\lim)_{x \overrightarrow{\infty}}\left[\sqrt{x+\sqrt{x+\sqrt{x}}} - \sqrt{x}\right] isequa < o$ 0 (b) $\frac{1}{2}$ (c) log 2 (d) e^4

A. 0

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

C. log 2

D. e^4

Answer: B

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7. $\lim_{x \to 1} [x - 1]$ where [] denotes the greatest integer function is equal to

A. 1

B. 2

C. 0

D. Does not exist

Answer: D

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8. Find The value of $\lim_{x \to \pi} \frac{1 + \cos^3 x}{\sin^2 x}$ is

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

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

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

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

Answer: B

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9. The value of $\lim_{x \to \infty} \frac{(x+2)! + (x+1)!}{(x+2)! - (x+1)!}$ is

A. 1

B. 2

C. 3

D. 4

Answer: A

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10. $\lim_{a \to \infty} \left[\frac{1}{1-a^4} + \frac{8}{1-a^4} + \cdots + \frac{a^3}{1-a^4} \right]$ is equal to

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

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

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

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

Answer: D

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11. If f(x) = $\begin{cases} x+2 & x \leq -1 \\ cx^2 & x > -1 \end{cases}$ then find c if $\lim_{x \to -1}$ f(x) exists .

A. -1

B. 1

C. 0

D. 2

Answer: B

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12. The value of $\lim_{x \to \pi/4} \frac{2 - \cot x - \cot^3 x}{1 - \cot^3 x}$

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

B. 1

C. 0

D. none of these

Answer: A

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13. Find the value of $\lim_{x \to 0} \frac{\sin x - 2\sin 3x + \sin 5x}{x}$

A. -1

B. 0

C. 1

D. 3

Answer: B

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14. If f(x) = $\begin{cases} x^2 - 1 & 0 < x < 2 \\ 2x + 3 & 2 \leq x < 3 \end{cases}$ then quadratic equation whose roots are $\lim_{x \to 1}$ f(x) and $\lim_{x \to 2^+}$ f(x is

A. $x^2 - 6x + 9 = 0$

B. $x^2 - 7x + 8 = 0$

C. $x^2 - 14x + 49 = 0$

D. $x^2 - 10x21 = 0$

Answer: D

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

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

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

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

D. None of these

Answer: A

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

A. 1

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

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

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

Answer: C

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17. The value of ordered pair (a,b) such that $\lim_{x \to 0} \frac{x(1 + a\cos x) - b\sin x}{x^3} = 1,$ is:

A. $(5)/(3), \frac{3}{2}$

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

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

D. None of these

Answer: C

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18. $\lim_{n \to \infty} \sin\left[\pi\sqrt{n^2+1}\right]$ is equal to

A. ∞

B. 0

C. Does not exist

D. None of these

Answer: B

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

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

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

C. e^{-1}

D. 1

Answer: B

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20. Evaluate, $\lim_{x \to 1} \frac{x^4 - 1}{x - 1} = \lim_{x \to k} \frac{x^3 - k^3}{x^2 - k^2}$, then find the value of k.

A. $\frac{-8}{3}$

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

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

D. None of these

Answer: D

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

A. e^3

B. e^{-3}

C. e^{-2}

D. e^2

Answer: C

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22. $\lim_{x \to 0} \frac{\sin x - x}{x^3}$

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

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

C. -1

D. -6

Answer: B

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23. $\lim_{x \to 0} \left[\frac{1^x + 2^x + 3^x + \cdots + n^x}{n} \right]^{\frac{1}{x}}$ is equal to

A. $(n!)^{a/n}$

B. $(n!)^a$

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

D. None of these

Answer: A

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24. The polynomial of least degree such that $\lim_{x \to 0} \left(1 + \frac{x^2 + f(x)}{x^2}\right)^{1/x} = e^2$ is

A. $2x^3 + x^2$

B. $2x^3 - x^2$

C. $2x^2 + 3x^3$

D. None of these

Answer: B

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25. Evaluate: $(\lim)_{x \to 0} \frac{\sin^{-1} x - \tan^{-1} x}{x^3}$

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

B. 2

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

D. None of these

Answer: A

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26. The value of p for which the function f(x) = $\begin{cases} \frac{(4^x-1)^3}{\sin\left(\frac{x}{p}\right)\log\left(1+\frac{x^2}{3}\right)} & x \neq 0 \\ 12(\log 4)^3 & x = 0 \end{cases}$ may be continuous at x =0 is

A. 1

B. 2

C. 3

D. None of these

Answer: D

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27. The value of $\lim_{x \to 0} \left(\frac{a^x + b^x}{2} \right)^{\frac{1}{x}}$ is

A. $(abc)^3$

B. abc

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

D. None of these

Answer: D

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28. The values of a,b and c, such that $\lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$ are

A. a = 1,b = − 2, c = 1

B. a = 1,b = 2, c = − 1

C. a = 1,b = 2, c = 1

D. a = − 1,b = 2, c = 1

Answer: C

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29. $(\lim)_{x \to \infty}\left(an - \frac{1+n^2}{1+n}\right) = b,$ where a is a finite number, then $a = 1$ (b) $a = 0$ (c) $b = 1$ (d) $b = -1$

A. a=2

B. a=0

C. b=1

D. b=-1

Answer: C

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30. The value of $f(0)$, so that the function $f(x) = \frac{(27-2x)^2 - 3}{9 - 3(243+5x)^{1/5} - 2}(x \neq 0)$ is continuous, is given $\frac{2}{3}$ (b) 6 (c) 2 (d) 4

A. $2/3$

B. 6

C. 2

D. 4

Answer: C

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31. If f(x) = $\begin{cases} |x|\cos\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$ then f(x)is

A. discontinuous at x = 0

B. continuous at x = 0

C. Does not exist

D. None of these

Answer: B

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32. If $f(x) = \begin{cases} \frac{\sqrt{1+kx}-\sqrt{1-kx}}{x} & \text{if} -1 \leq x < 0 \\ \frac{2x+k}{x-1} & \text{if} 0 \leq x \leq 1 \end{cases}$

is continuous at x = 0, then the value of k is

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

B. 1

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

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

Answer: D

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33. If $f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$, then

A. f(0 + 0) = 1

B. f (0 − 0) = 1

C. f (x) is continuous at x = 0

D. None of the above

Answer: C

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34. Let $f(x) = -1 + |x - 2|$ and $g(x) = 1 - |x|$ then set of all possible value (s) of for which (fog) (x) is

discontinuous is:

A. {0,2}

B. {0,1,2}

C. {0}

D. an empty set

Answer: D

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35. If f(x) = $\begin{cases} |x| + 3 & \text{if} x \leq -3 \\ -2x & \text{if} -3 < x < 3 \text{then f(x) is} \\ 6x + 2 & \text{if} x \geq 3 \end{cases}$

A. continuous at x = −3 and discontinuous at x = 3

B. continuous at x = − 3, 3

C. discontinuous at x = − 3, 3

D. continuous at x = 3 and discontinuous at x = − 3

Answer:

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36. If the function $f(x) = \frac{(3x + 4\tan x)}{x}$ continuous at x=0? If not, hwo may the funcation be defined to make it continuous at this point ?

A. $f(x) = \begin{cases} \frac{3x+4\tan x}{x} & x \neq 0 \\ 7 & x = 0 \end{cases}$

B. $f(x) = \begin{cases} \frac{3x+4\tan x}{x} & x \neq 0 \\ 6 & x = 0 \end{cases}$

C. $f(x) = \begin{cases} \frac{3x+4\tan x}{x} & x = 0 \\ 7 & x \neq 0 \end{cases}$

D. None of these

Answer: A

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37. The value of $f(0)$ so that the function $f(x) = \frac{2x - \sin^{-1} x}{2x + \tan^{-1} x}$ is continuous at each point on its domain is:

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

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

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

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

Answer: D

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38. For what value of k, function $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$?

A. 1

B. 3

C. R

D. 6

Answer: A

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39. If f(x) = $\begin{cases} |x-a|\sin\frac{1}{x-a} & \text{if} x \neq a \\ 0 & \text{if} x = a \end{cases}$ then f(x) is

A. continuous at x = a

B. discontinuous at x = a

C. discontinuous for all x $\in$ R

D. None of the above

Answer: B

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40. The value of p and q for which the function

$$f(x) = \begin{cases} \frac{\sin(p+1)x + \sin x}{x} & , \quad x < 0 \\ q & , \quad x = 0 \\ \frac{\sqrt{x+x^2} - \sqrt{x}}{x^{1/2}} & , \quad x > 0 \end{cases}$$

is continuous for all x in R, are

A. $p = \frac{5}{2}, q = \frac{1}{2}$

B. $p = -\frac{3}{2}, q = \frac{1}{2}$

C. $p = \frac{1}{2}, q = \frac{3}{2}$

D. $p = \frac{1}{2}, q = -\frac{3}{2}$

Answer: D

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41. If f(x) = $\begin{cases} x^k \sin\left(\frac{1}{x}\right) & x \neq 0 \\ 0 & x = 0 \end{cases}$ is continous at x =0 then

A. $k \in (-\infty, 0)$

B. $k \in (1, \infty)$

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

D. none of these

Answer: D

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42. If $f(x) = \frac{\sqrt{1+\sin x} - \sqrt{1-\sin x}}{x}$, then we value of f at x = 0, so that f is continuous everywhere, is `

A. $1/4$

B. -1

C. 1

D. 2

Answer: C

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43. The function defined by

$$f(x) = \begin{cases} \left(x^2 + e^{\frac{1}{2-x}}\right)^{-1}, & x \neq 2 \\ k, & x = 2 \end{cases}$$ is continuous from right at the point x =2, then k is equal to

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

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

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

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

Answer: C

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44. If f(x) = $\frac{\left(3^x - 1\right)^2}{\sin x . \log_e(1+x)}, x \neq 0$ is continuous at x =0 then f(0) is

A. $\log_e 3$

B. $2\log_e 3$

C. $\left(\log_e 3\right)^2$

D. None

Answer: C

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45. If a function f : R $\rightarrow R$ satisfy the equation f(x+y) = f(x)+ f(y) , $\forall x, y$ and the function (x) is continuous at x =0 then

A. f(x) is continuous for all positive real values of x

B. f (x) is continuous for all x

C. f(x) = 0 for all x

D. None of the above

Answer: B

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46. Find the values of a and b sucht that the function f defined by

$$fx = \begin{cases} \frac{x-4}{|x-4|} + a & \text{if } x < 4 \\ a + b & \text{if } x = 4 \\ \frac{x-4}{|x-4|} + b & \text{if } x > 4 \end{cases}$$

is a continous function at $x = 4$.

A. a = 1and b = −1

B. a = −1and b = 1

C. a = 0 and b = − 1

D. a = 1 and b = 0

Answer: A

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47. If f(x) = $\frac{\sqrt{2}\cos x - 1}{\cot x - 1}, x \neq \frac{\pi}{4}$ then the value of f $\left(\frac{\pi}{4}\right)$ so that f(x) becomes continous at x = $\frac{\pi}{4}$ is

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

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

C. 1

D. 9

Answer: A

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48. $f(x) = \begin{cases} \frac{1-\cos 4x}{x^2} & x < 0 \\ = a & x = 0 \\ = \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4} & x > 0 \end{cases}$ If the function be continuous at x = 0, then a =

A. 2

B. 4

C. 6

D. 8

Answer: D

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49. If the function

$$f(x) = \begin{cases} x + a^2\sqrt{2}\sin x, & 0 \leq x < \frac{\pi}{4} \\ x\cot x + b, & \frac{\pi}{4} \leq x < \frac{\pi}{2} \\ b\sin 2x - a\cos 2x, & \frac{\pi}{2} \leq x \leq \pi \end{cases}$$

is continuous in the interval $[0, \pi]$ then the values of (a, b) are

A. (0,0)

B. $\left(0, \frac{1}{2}\right)$

C. (0,1)

D. (-1,1)

Answer: A

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50. If f(x) = $\frac{a\sin x + \sin 2x}{x^3} \neq 0$ and f(x) is continuous at x =0 then

A. a=2

B. f(0) =1

C. f(0) =-1

D. a =1

Answer: C

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51. $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$, then is the value of $\lim_{h \to 0} \frac{f(1-h) - f(1)}{h^3 + 3h}$ is

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

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

C. 13

D. $\frac{22}{13}$

Answer: A

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52. Given that $f'(B) = 6$ and $f'(A) = 4$ then $\lim_{h \to 0} \frac{f(2h + 2 + h^2) - f(2)}{f(h - h^2 + 1) - f(1)}$ is :

A. 3

B. $-3/2$

C. $3/2$

D. Does not exist

Answer: A

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53. If f(x) = $\begin{cases} e^x & x \leq 0 \\ |1-x| & x > 0 \end{cases}$ then

A. f(x) is differentiable at x = 0

B. f (x) is continuous at x = 0,1

C. f (x) is differentiable at x = 1

D. None of the above

Answer: B

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54. The function $f(x) = \begin{cases} |x-3|, & x \geq 1 \\ \left(\frac{x^2}{4}\right) - \left(\frac{3x}{2}\right) + \frac{13}{4}, & x < 1 \end{cases}$ is

A. continuous at x = 1

B. continuous at x = 3

C. differentiable at x = 1

D. All of these

Answer: C

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55. If $\lim_{x \to 0} \frac{\log(a+x) - \log a}{x} + k \lim_{x \to 0} \frac{\log x - 1}{x - e} = 1$ then

A. $k = e\left(1 - \frac{1}{a}\right)$

B. k = e (1+a)

C. k=e (2-a)

D. equality is not possible

Answer: A

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56. If $f(x) = \begin{cases} xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)} & x \neq 0 \\ 0 & x = 0 \end{cases}$ then f(x) is

A. continuous as well as differentiable for all x

B. continuous for all x but not differentiable at x = 0

C. neither differentiable nor continuous at x = 0

D. discontinuous everywhere

Answer: B

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57. Consider the greatest integer function, defined by $f(x) = [x], 0 \leq x < 2$. Then,

A. f is derivable at x = 1

B. f is not derivable at x = 1

C. f is derivable at x = 2

D. None of these

Answer: B

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58. Let f(x) $= \lambda + \mu|x| + v|x|^2$ where λ, u, v are real constants . Then f(0) exists if

A. $\mu = 0$

B. v=0

C. $\lambda = 0$

D. $\mu = v$

Answer: A

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59. Consider a function f :R $\rightarrow R$ which satisfies the equation f (x + y) = f (x) . f (y), $\forall$ x, y $\in$ R, f (x) $\neq$ 0. Suppose that the function is differentiable at x = 0 and f'(0) = 2. Then, f (x) is equal to

A. f(x)

B. 2 f(x)

C. $\frac{1}{2}f(x$

D. None

Answer: B

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60. Consider the function f(x) defined by

$$f(x) = \begin{cases} x & \leq 1 \\ x^2 + bx + c & x > 1 \end{cases}$$

Let f(x) exists finitely $\forall x \in R$. Then

A. b=-1 , c $\in R$

B. $c = 1, b \in R$

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

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

Answer: D

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61. Consider the function f(x) $= |\log_e x| \forall x > 0.$ Then

A. LHD does not exist at x = 1

B. RHD does not exist at x = 1

C. f is differentiable at x = 1

D. f is not differentiable at x = 1

Answer: D

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62. Consider the function f (x) defined by f (x) = |x − 2|+|x| +|x + 2|. Then

A. f is derivable at x = 0, 2

B. f is derivable at x = − 2, 0

C. f is derivable at x = −2,2

D. f is not derivable at x = − 2, 0, 2

Answer: D

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1. $\lim_{x \to 0} (1+x)^8 - 1$ is equal

A. 8

B. 6

C. 4

D. 2

Answer: C

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2. $\lim_{x \to \tan^{-1} 3} \frac{\tan^2 x - 2\tan x - 3}{\tan^2 x - 4\tan x + 3}$ is equal to

A. 1

B. 2

C. 0

D. 3

Answer: B

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3. $\lim_{x \to -\infty} \frac{x^4 . \sin\left(\frac{1}{x}\right) + x^2}{1 + |x|^3}$ is equal to

A. 0

B. -1

C. 2

D. 1

Answer: B

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4. $\lim_{x \to 1} \frac{x^m - 1}{x^n - 1}$ is equal to

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

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

C. $\frac{2m}{n}$

D. $\frac{2n}{m}$

Answer: B

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5. If f(x) = $= \begin{cases} \left[\tan\left(\frac{\pi}{4}+x\right)\right]^{1/x} & x \neq 0 \\ k & x = 0 \end{cases}$

For what value of k f(x) is continuous at x=0 ?

A. 1

B. 0

C. e

D. e^2

Answer: D

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6. The value of $\lim_{x \to 0} \left(\frac{1 + 5x^2}{1 + 3x^2} \right)^{\frac{1}{x^2}}$ is

A. e^2

B. e

C. 1/e

D. $1 / e^2$

Answer: A

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7. $\lim_{x \to 0} \frac{(2 + x)\sin(2 + x) - 2\sin 2}{x}$ is equal to

A. sin 2

B. cos 2

C. 1

D. 1 cos 2 + sin 2

Answer: D

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8. If $f(x) = \left(\frac{3x + \tan^2 x}{x}\right)$ is continuous at $x = 0$, then $f(0)$ is equal to.

A. 3

B. 2

C. 4

D. 0

Answer: A

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9. If $f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$ for $x \neq 0$ and $f(0) = k$ and f(x) is continuous at x = 0 then k is equal to

A. a+b

B. a-b

C. a

D. b

Answer: A

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10. $\lim_{x \to 0} \frac{\sin x}{x}$

A. 2

B. -1

C. 1

D. 0

Answer: C

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11. $\lim_{x \to 0} \frac{\cos(\sin x) - 1}{x^2}$

A. 1

B. -1

C. $1/2$

D. $-1/2$

Answer: D

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12. In order that the function $f(x) = (x+1)^{\frac{1}{x}}$ is continuous at x = 0, f(0) must be defined as

A. f(0) =0

B. f(0) =e

C. f(0) =1/e

D. f(0) =1

Answer: B

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13. The function f (x) = |x | at x = 0 is

A. continuous but non-differentiable

B. discontinuous and differentiable

C. discontinuous and non-differentiable

D. continuous and differentiable

Answer: C

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14. $\lim_{x \to 0} (\cos ecx)^{1/\log x}$ is equal to

A. 0

B. 1

C. 1/e

D. none of these

Answer: C

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

A. e

B. e^2

C. e^4

D. e^5

Answer: D

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16. The set of points where the function $f(x) = x|x|$ is differentiable is

A. $(-\infty, \infty)$

B. $(-\infty, 0) \cup (0, \infty)$

C. (o, ∞)

D. $[0, \infty)$

Answer: A

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17. $\lim_{x \to 2} \frac{\sqrt{1+\sqrt{2+x}}-\sqrt{3}}{x-2}$ is equal to

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

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

C. $8\sqrt{3}$

D. $\sqrt{3}$

Answer: A

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18. $\lim_{x \to 1} (1-x)\tan\left(\frac{\pi x}{2}\right)$

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

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

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

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

Answer: B

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19. If f: $R \to R$ is defined by f(x) = [x -3] + | x-4| for x $\in R$ then $\lim_{x \to 3^-}$ f(x) is equal to

A. -2

B. -1

C. 0

D. 1

Answer: C

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20. If f : R $\rightarrow R$ 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. 1

C. 2

D. 3

Answer: B

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

A. -2

B. 1

C. 2

D. 3

Answer: C

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22. If $\lim_{x \to \infty} \left[\frac{x^3 + 1}{x^2 + 1} - (ax + b) \right]$ =2 then

A. a =1 and b =1

B. a=1 and b=-1

C. a=1 and b=-2

D. a=1 and b=2

Answer: C

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23. If f(x) = $\begin{cases} \frac{1-\cos x}{x} & x \neq 0 \\ x & x = 0 \end{cases}$ is continuous at x =0 then the value of k is

A. 0

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

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

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

Answer: A

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

A. $1/2$

B. $-1/2$

C. 0

D. 1

Answer: A

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25. If f(x) = $\begin{cases} \frac{\sin 5x}{x^2+2x} & x \neq 0 \\ k+\frac{1}{2} & x=0 \end{cases}$ is continuous at x =0 then the value of k is

A. 1

B. -2

C. 2

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

Answer: C

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26. The value of the constant α and β such that $\lim_{x \to \infty} \left(\frac{x^2+1}{x+1} - \alpha x - \beta \right)$ =0 are respectively

A. (1,1)

B. $(-1, 1)$

C. $(1, -1)$

D. (0,1)

Answer: C

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27. $\lim_{\theta \to \infty} \frac{4\theta(\tan\theta - 2\theta\tan\theta)}{(1 - \cos 2\theta)}$ is equal to

A. $1\sqrt{2}$

B. $1/2$

C. 1

D. 2

Answer: D

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28. Let $f(x) = \begin{cases} 1 & \forall \quad x < 0 \\ 1 + \sin x & \forall \quad 0 \leq x \leq \pi/2 \end{cases}$ then what is the value of $f'(x)$ at $x = 0$?

A. 1

B. -1

C. ∞

D. Does not exist

Answer: D

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