MATHS

BOOKS - NDA PREVIOUS YEARS

FUNCTIONS, LIMIT, CONTINUITY AND DIFFERENTIABILITY

Mcqs

1. Let R be the set of real numbers and let $f: R \to R$ be a function such that $f(x) = \frac{x^2}{1+x^2}$. What is the range of f?

A. R

B. $R - \{1\}$

C. [0,1]

D. [0,1)

Answer: D

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2. Let $f(x) = \frac{1}{\sqrt{18 - x^2}}$

What is the value of $\lim_{x \to 3} \frac{f(x) - f(3)}{x - 3}$?

A. 0

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

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

D. $\frac{1}{9}$

Answer: D

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3. Let $f(x + y) = f(y)$ and $f(1) = 2$ for all $x, y \in R$ where f(x) is continuous function. What is f(1) equal to ?

A. $2\log_e 2$

B. $\log_e 2$

C. 1

D. 0

Answer: A

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4. Given $f(x) = \log\left[\frac{(1+x)}{(1-x)}\right]$ and $g(x) = \frac{(3x+x^2)}{(1+3x^2)}$, then what is $f[g(x)]$ equal to ?

A. $-f(x)$

B. $3[f(x)]$

C. $[f(x)]^3$

D. $-3[f(x)]$

Answer: B

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5. What is the value of $\lim_{x \to 0} \frac{\sin|x|}{x}$?

A. 1

B. -1

C. ∞

D. Limit does not exist

Answer: D

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6. What is the equivalent definition of the function given by

$$f(x) = \begin{cases} 2x, & x \geq 0 \\ 0, & < 0 \end{cases}$$

A. $f(x) = |x|$

B. $f(x) = 2x$

C. $f(x) = |x| + x$

D. $f(x) = 2|x|$

Answer: C

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7. If $f: R \to R^+$ such that $f(x) = (1/3)^x$, the what is the value of $f^{-1}(x)$?

A. $(1/3)^x$

B. 3^x

C. $\log_{1/3} X$

D. $\log_x (1/3)$

Answer: C

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8. What is the value of $\lim_{x \to 0} \frac{x \sin 5x}{\sin^2 4x}$

A. 0

B. $\frac{5}{4}$

C. $\frac{5}{16}$

D. $\frac{25}{4}$

Answer: C

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9. If $f(x) = (1+x)^{5/x}$ is continuous at x=0, then what is the value of f(0)?

A. 0

B. 1

C. ∞

D. e^5

Answer: D

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10. Consider the following statements:

1. The function f(x) = greatest integer $\leq x, x \in R$ is a continuous function.

2. All trigonometric functions are continuous on R.

Whict of the statements given above is/ are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

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11. If $\lim_{x \to a} \left[\frac{f(x)}{g(x)}\right]$ exists, then which one of the following correct ?

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

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

C. Both $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ need not exist

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

Answer: A

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12. If $f(x) = \begin{cases} mx + 1 & \text{if } x \leq \frac{\pi}{2} \\ \sin x + n & \text{if } x > \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then

A. $m = 1, n = 0$

B. $m = \frac{n\pi}{2} + 1$

C. $n = m\left(\frac{\pi}{2}\right)$

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

Answer: C

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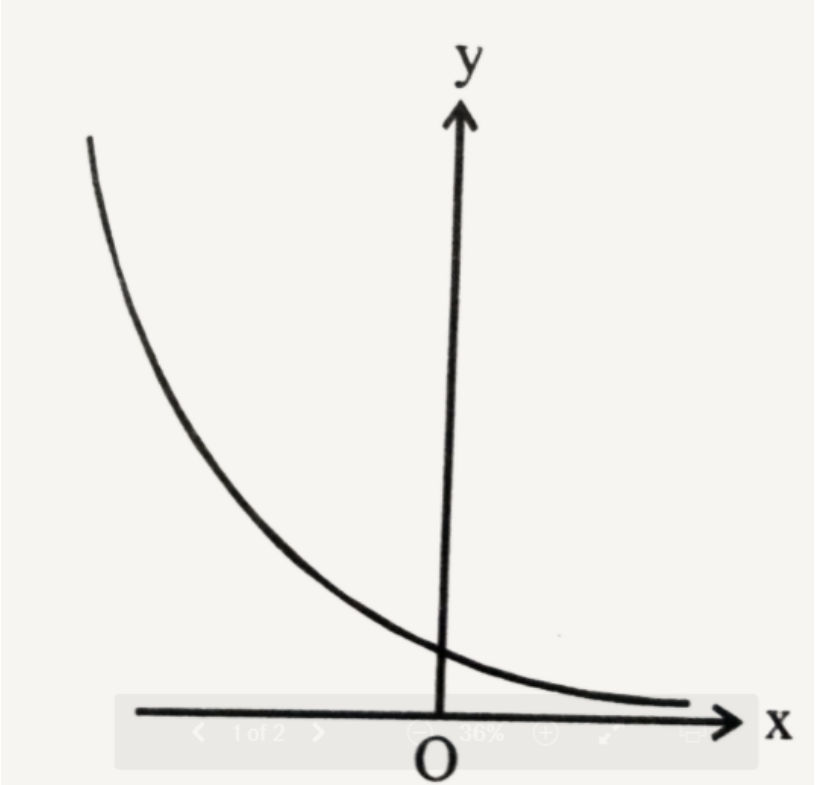
13.



The above curve shows the graph of a^x under which one of the following conditions ?

A. $a \geq 1$

B. $a > 1$

C. $0 < a \leq 1$

D. $0 < a < 1$

Answer: D

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14. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, then f $\left(\frac{2x}{1+x^2}\right)$ is equal to

A. $(f(x))^2$

B. 1

C. $2f(x)$

D. $f\left(\frac{1-x}{1+x}\right)$

Answer: C

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15. If $f(x) = (x+1)^{\cot x}$ is continuous at x=0, then what is f(0) equal to?

A. 1

B. e

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

D. e^2

Answer:

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16. What is the value of $\lim_{x \to \infty} \left(\frac{x-2}{x+2}\right)^{x+2}$ = ?

A. 0

B. e^4

C. e^{-2}

D. e^{-4}

Answer: D

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17. If the derivative of the function $f(x) = \{ax^2 + b, x < -1 \text{ and } bx^2 + ax + 4, x \leq -1$ is everywhere continuous, then-

A. $a = 2, b = 3$

B. $a = 3, b = 2$

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

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

Answer: A

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18. If $f(x)$ is differentiable everywhere, then which one of the following is correct?

A. $|f|$ is differentiable everywhere

B. $|f|^2$ is differentiable everywehere

C. $f|f|$ is not differentiable at some points

D. None of the above

Answer: C

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19. Consider the cubic equation $x^3 + ax^2 + bx + c = 0$, where a, b, c are real numbers, which of the following statements is correct?

A. If $b^2 - 4ac > 0$ then $f^{-1}(0)$ does not contain 0

B. If $b^2 - 4ac < 0,$ then $f^{-1}(0)$ must contain 0

C. If $b^2 - 4ac > 0,$ then $f^{-1}(0)$ may contain 0

D. If $b^2 - 4ac < 0$, then $f^{-1}(0)$ may contain 0

Answer: A

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20. If $\frac{x-a}{b+c} + \frac{x-b}{c+a} + \frac{x-c}{a+b} = 3$ then value of x is

A. 0

B. 1

C. $a + b + c$

D. abc

Answer: C

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21. If $-x^2 + 3x + 4 > 0$, then which one of the following is correct?

A. $x \in (-1, 4)$

B. $x \in [-1, 4]$

C. $x \in (\infty, -1) \cup (4, \infty)$

D. $x \in (-\infty, -1) \cup (4, \infty)$

Answer: A

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22. Given $f(x) = x + \frac{1}{x}$, then what is $f^2(x)$ equal ot ?

A. $\frac{x^2+1}{x} + \frac{x}{x^2+1}$

B. $(x + 1/x)^2$

C. $x^4 + (11/x^4)$

D. $x^2 + (1/x^2)$

Answer: B

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23. If $f(x) = \begin{cases} 1 & x \text{ is a rational number} \\ 0, & \text{x is an irrational number} \end{cases}$ what is/are the value (s) of $(fof)\left(\sqrt{3}\right)$?

A. 0

B. 1

C. Both 0 and 1

D. None of these

Answer: B

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24. A function f is defined as follows

$$f(x) = x^p \cos\left(\frac{1}{x}\right), x \neq 0$$

$$f(0) = 0$$

What conditions should be imposed on p so that f may be continuous at x=0 ?

A. p=0

B. $p > 0$

C. $p < 0$

D. No value of p

Answer: B

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25. What is the value of $\lim_{x \to 0} \frac{\sin x}{x}$?

A. 1

B. 0

C. ∞

D. -1

Answer: B

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26. What is $\lim_{x \to 0} \frac{a^x - b^x}{x}$?

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

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

C. ab

D. log (ab)

Answer: A

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27. Let $f(x) = \begin{cases} 3x - 4, & 0 \leq x \leq 2 \\ 2x + l, & 2 < x \leq 9 \end{cases}$

If is continuous at x=2, then what is the value of l ?

A. 0

B. 2

C. -2

D. -1

Answer: C

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28. If $f(x) = x$ and $g(x) = |x|$, then what is $(f + g)(x)$ equal to ?

A. 0 for all $x \in R$

B. 2x for all $x \in R$

C. $\begin{cases} 2x, & \text{for} \quad x \geq 0 \\ 0, & \text{for} \quad x < 0 \end{cases}$

D. $\begin{cases} 0, & \text{for} \quad x \geq 0 \\ 2x, & \text{for} \quad x < 0 \end{cases}$

Answer: C

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29. If $g(x) = \sin x, x \in R$ and $f(x) = \frac{1}{\sin x}, x \in \left(0, \frac{\pi}{2}\right)$ what is (gof) (x) equal to ?

A. 1

B. $\frac{1}{\sin(\sin x)}$

C. $\frac{1}{\sin^2(x)}$

D. $\sin\left(\frac{1}{\sin x}\right)$

Answer: D

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30. Let $f: R \to R$ be defined as $f(x) = \sin(|x|)$

Which one of the following is correct?

A. f is not differentiable only at 0

B. f is differentiable at 0 only

C. f is differentiable everywhere

D. f is non-differentiable at many points

Answer: A

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31. What is the inverse of the function $y = 5^{\log x}$?

A. $x = 5^{1/\log y}$

B. $x = y^{1/\log 5}$

C. $x = 5^{\log y}$

D. $x = y^{\log 5}$

Answer: B

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32. Assertion (A) : If $f(x) = \log x, \quad \text{then} \quad f(x) > 0 \quad \text{for all} \quad x > 0.$

Reaosn (R) : $f(x) = \log x,$ is defined for all $x > 0$

A. Both A and R are individually true, and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: D

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33. Assertion (A) : f(x) $= x \sin\left(\frac{1}{x}\right)$ is differentiable at x=0 Reason (R): F(x)is continuous at x=0

A. Both A and R are individually true, and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

Answer: D

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34. If $f(x) = \log|x|, x \neq 0$, then what is $f'(x)$ equal to ?

A. $(1)(|x|)$

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

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

D. None of these

Answer: A

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35. $\lim_{x \to 0} e^{-1/x}$ is equal to

A. 0

B. ∞

C. e

D. does not exist

Answer: D

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36. Let $g: R \to R$ be a function such that, $g(x) = 2x + 5$. Then, what is $g^{-1}(x)$ equal to ?

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

B. 2x-5

C. $x-\frac{5}{2}$

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

Answer: A

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37. Consider the following statements:

1. $\lim_{x \to 0} \frac{x^2}{x}$ exists.
2. $\left(\frac{x^2}{x}\right)$ is not continuous at x=0
3. $\lim_{x \to 0} \frac{|x|}{x}$ does not exist.

Which of the statement given above are correct ?

A. 1,2 and 3

B. 1 and 2 only

C. 2 and 3 only

D. 1 and 3 only

Answer: D

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38. Let $f(x) = \frac{1}{1 - |1 - x|}$. Then, what is $\lim_{x \to 0} f(x)$ equal to

A. 0

B. ∞

C. 1

D. -1

Answer: C

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39. What is the value of $\lim_{x \to a} \frac{\sqrt{\alpha + 2x} - \sqrt{3x}}{\sqrt{3\alpha + x} - 2\sqrt{x}}$?

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

B. $\frac{1}{\left(3\sqrt{3}\right)}$

C. $\frac{2}{\left(3\sqrt{3}\right)}$

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

Answer: C

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40. Assertion (A) : The function

$f: (1, 2, 3) \to (a, b, c, d)$ defined by

$f = \{(1, a), (2, b), (3, c)\}$ has no inverse.

Reason (R) f is not one-one.

A. Both A and R are individually true, and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true

Answer: C

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41. Assertion (A) : $y = 2x + 3$ is a one to one real valued function.

Reason (R) : $x_1 \neq x_2$

$\Rightarrow y_1 \neq y_2, y_1 = 2x_1 + 3, y_2 = 2x_2 + 3$ for any two real x_1 and x_2

A. Both A and R are individually true, and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true

Answer: A

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42. The function $f. R \to R$ defined by $f(x) = \left(x^2 + 1\right)^{35}$ for all $x \in R$ is

A. one-one but not onto

B. onto but not one-one

C. neither one-one nor onto

D. both one-one and onto

Answer: C

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43. Let $f: R \to R$ be a function defined as $f(x) = x|x|$, for each $x \in R$, R being the set of real numbers. Which one of the following is correct?

A. f is one -one but not onto

B. f is onto but not one-one

C. f is both one-one and onto

D. f is neither one-one nor onto

Answer: C

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44. The set of all points, where the function $f(x) = \frac{x}{1 + |x|}$ is differentiable, is given by

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

B. $(0, \infty)$ only

C. $(-\infty, 0) \cup (0, \infty)$ only

D. $(-\infty, 0)$ only

Answer: A

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45. Let $y(x) = ax^n$ and δy dentoe samll change in y. what is limit of $\frac{\delta y}{\delta x} as \delta x \to 0$?

A. 0

B. 1

C. anx^{n-1}

D. $ax^n \log(ax)$

Answer: A

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46. What is $\lim_{x \to 0} \frac{\sin^2 ax}{bx}$ (a,b are constants) equal to ?

A. 0

B. a

C. a/b

D. Does not exist

Answer: A

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47. If $f(x) = \begin{cases} 3x - 4, & 0 \leq x \leq 2 \\ 2x + \lambda, & 2 < x \leq 3 \end{cases}$

is continouous at x=2, then what is the value of λ?

A. 1

B. -1

C. 2

D. -2

Answer: D

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48. A mapping $f: R \to R$ which is defined as $f(x) = \cos x, x \in R$ is

A. One-one olny

B. Onto only

C. One-one onto

D. Neither one-one nor onto

Answer: D

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49. What is $\lim_{x \to \infty} \left(\frac{x}{3+x} \right)^{3x}$ equal to?

A. e

B. e^3

C. e^{-9}

D. e^9

Answer: C

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50. Consider the following function $f: R \to R$ such that $f(x) = x \text{ if } x \geq 0 \text{ and } f(x) = -x^2 \text{ if } x < 0$. Then, which one of the following is correct?

A. f(x) is continuous at every $x \in R$

B. f(x) is continuous at x=0 only

C. f(x) is discontinous at x=0 only

D. f(x) is discontinuous at every $x \in R$

Answer: A

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51. Which one of the following functions $f: R \to R$ is injective?

A. $f(x) = |x|$ for all $x \in R$

B. $f(x) = x^2$ for all $x \in R$

C. $f(x) = 11$ for all $x \in R$

D. $f(x) = -x$ for all $x \in R$

Answer: D

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52. The function $f(x) = e^x, x \in R$ is

A. onto but not one-one

B. one-one onto

C. one-one but onto

D. neither one-one nor onto

Answer: C

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53. What is the value of $\lim_{x \to \infty} \left(\frac{x+6}{x+1} \right)^{x+4}$

A. e

B. e^2

C. e^4

D. e^5

Answer: D

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54. If

$f: R \to R, g: R \to R$ and $g(x) = x + 3$ and $(fog)(x) = (x + 3)^2$,

then what is the value of $f(-3)$?

A. -9

B. 0

C. 9

D. 3

Answer: C

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55. What is the value of $\lim_{x \to 1} \frac{(x-1)^2}{|x-1|}$?

A. 0

B. 1

C. -1

D. The limit does not exist

Answer: A

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56.

	List I (Function)	List II (Property)
A.	$\sin x$	1. Periodic function
B.	$\cos x$	2. Non-periodic function
C.	$\tan x$	3. Continuous at every point on $(-\infty, \infty)$
		4. Discontinuous function
		5. Differentiable at every point on $(-\infty, \infty)$
		6. Not differentiable at every point on $(-\infty, \infty)$
		7. has period π
		8. has period 2π
		9. increases on $\left(0, \frac{\pi}{2}\right)$
		10. decreases on $\left(0, \frac{\pi}{2}\right)$
		11. increases on $\left(\frac{\pi}{2}, \pi\right)$
		12. decreases on $\left(\frac{\pi}{2}, \pi\right)$

A is associated with

A. 1,3,4,8,9,12

B. 2,4,6,8,10,11

C. 1,3,5,7,10,11

D. None of these

Answer: A

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57.

List I (Function)	List II (Property)
A. $\sin x$	1. Periodic function
B. $\cos x$	2. Non-periodic function
C. $\tan x$	3. Continuous at every point on $(-\infty, \infty)$
	4. Discontinuous function
	5. Differentiable at every point on $(-\infty, \infty)$
	6. Not differentiable at every point on $(-\infty, \infty)$
	7. has period π
	8. has period 2π
	9. increases on $\left(0, \frac{\pi}{2}\right)$
	10. decreases on $\left(0, \frac{\pi}{2}\right)$
	11. increases on $\left(\frac{\pi}{2}, \pi\right)$
	12. decreases on $\left(\frac{\pi}{2}, \pi\right)$

B is associated with

A. 2,3,5,8,9,12

B. 1,3,5,8,10,12

C. 1,3,5,8,9,12

D. None of these

Answer: D

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58.

	List I (Function)	List II (Property)
A.	$\sin x$	1. Periodic function
B.	$\cos x$	2. Non-periodic function
C.	$\tan x$	3. Continuous at every point on $(-\infty, \infty)$
		4. Discontinuous function
		5. Differentiable at every point on $(-\infty, \infty)$
		6. Not differentiable at every point on $(-\infty, \infty)$
		7. has period π
		8. has period 2π
		9. increases on $\left(0, \frac{\pi}{2}\right)$
		10. decreases on $\left(0, \frac{\pi}{2}\right)$
		11. increases on $\left(\frac{\pi}{2}, \pi\right)$
		12. decreases on $\left(\frac{\pi}{2}, \pi\right)$

C is associated with

A. 1,4,6,7,9,11

B. 2,4,8,9

C. 1,4,6,7,9

D. None of these

Answer: C

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59. Consider the following statements

1. Every function has a primitive

2. A primintive of a function is unique.

Which of the statements given above is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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60. The function $f(x) = \frac{x}{x^2 + 1}$ from R to R is

A. one-one as well as onto

B. onto but not one-one

C. neither one-one nor onto

D. one-one but not onto

Answer: D

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61. The function f(x)=cosec x is

A. continuous for all values of x

B. discontinuous everywhere

C. continuous for all x except at $x = n\pi$, where n is an integer

D. continuous for all x except at $x = n\pi/2$, where n is an integer

Answer: C

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62. Consider the following statements:

I. $f(x) = |x - 3|$ is continuous at x=0.

II. $f(x) = |x - 3|$ is differentiable at x=0.

Which of the statements given above is/ are corrent?

A. I only

B. II only

C. Both I and II

D. Neither I nor II

Answer: C

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63. Consider the function $f: R \to \{0, 1\}$ such that

$$f(x) = \begin{cases} 1, & \text{if} \quad x \text{ is rational} \\ 0, & \text{if} \quad \text{x is irratinal} \end{cases}$$

Which one of the following is correct?

A. The function is one-one into

B. The function is many-one into

C. The function is one-one onto

D. The function is many-one onto

Answer: C

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64. What is the value of $\lim_{x \to 0} \frac{\cos(ax) - \cos(bx)}{x^2}$

A. a-b

B. a+b

C. $\frac{b^2 - a^2}{2}$

D. $\frac{b^2 + a^2}{2}$

Answer: C

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65. If $f(x) = 2x + 7$ and $g(x) = x^2 + 7, x \in R$, then what are values of x for which fog(x)=25?

A. $-1, 1$

B. $-2, 2$

C. $-\sqrt{2}, \sqrt{2}$

D. None of these

Answer: C

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66. What is $\lim_{x \to 0} \frac{a^x - b^x}{x}$ equal to?

A. ln (ab)

B. $\frac{\ln a}{\ln b}$

C. $\ln\left(\frac{a}{b}\right)$

D. $\ln\left(\frac{b}{a}\right)$

Answer: C

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67. If the function

$$f(x) = \frac{x(x-2)}{x^2 - 4}, x \neq \pm 2$$

is continuous at x=2, then what is f(2) equal to?

A. 0

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

C. 1

D. 2

Answer: B

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68. At how many points is the fucntion $f(x) = [x]$ discontinuous?

A. 1

B. 2

C. 3

D. Infinite

Answer: D

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69. If $f(x) = \frac{2}{3}x + \frac{3}{2}, x \in R,$

then what is $f^{-1}(x)$ equal to ?

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

B. $\frac{3}{2}x - \frac{9}{4}$

C. $\frac{2}{3}x - \frac{4}{9}$

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

Answer: B

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70. What is $\lim_{x \to \infty} \left(\sqrt{a^2x^2ax + 1}\sqrt{a^2x^2 + 1}\right)$ equal to?

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

B. 1

C. 2

D. 0

Answer: A

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71. What is the value of k for which the following fucntion f(x) is continuous for all x?

$$f(x) = \begin{cases} \frac{x^2 - 3x + 2}{(x-1)^2}, & \text{for } x \neq 1 \\ k, & \text{for } x = 1 \end{cases}$$

A. 3

B. 2

C. 1

D. -1

Answer: A

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72. Which one of the following is correct in respect of the function $f(x) = |x| + x^2$

A. f(x) is not continuous at x=0

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

C. f(x) us continuous but not differentible at x=0

D. None of the above

Answer: C

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73. Consider the following statements:

I. $f(x) = |x - 3|$ is continuous at x=0.

II. $f(x) = |x - 3|$ is differentiable at x=0.

Which of the statements given above is/ are corrent?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer:

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74. What is $\lim_{x \to 0} x^2 \sin\left(\frac{1}{x}\right)$ equal to?

A. 0

B. 1

C. $1/2$

D. Limit does not exist

Answer: A

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75. What is $\lim_{x \to -2} \left(\frac{1+2}{x^3+8} \right)$

A. $1/4$

B. $-1/4$

C. $1/2$

D. $-1/12$

Answer: C

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76. If $f(x)f[xy] = f[x]f[y]$ then $f[t]$ may be of the form:

A. t+k

B. ct+k

C. $t^k + c$

D. t^k

Answer: D

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77. Which one of the following functions is differentiable for all real values of x?

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

B. $x|x|$

C. $\frac{1}{|x|}$

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

Answer: B

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78. What is $\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x}$

A. 0

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

C. 1

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

Answer: B

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79. What is $\lim_{x \to 0} \frac{2(1-\cos x)}{x^2}$ equal to?

A. 0

B. $1/2$

C. $1/4$

D. 1

Answer: D

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80. Consider the following :

1. $\lim_{x \to 0} \frac{1}{x}$ exists.
2. $\lim_{x \to 0} \frac{1}{e^x}$ does not exist.

Which of the above is/are correct?

A. 1 only

B. 2only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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81. Which one of the following is correct in respect of the function $f(x) = \frac{x^2}{|x|}$ for $x \neq 0$ and $f(0) = 0$

A. f(x) is discontinuous every where

B. f(x)= is continuous every where

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

D. f(x) is discontinuous at x=0 only

Answer: B

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82. What is $\lim_{x \to 2} \frac{x-2}{x^2-4}$ equal to?

A. 0

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

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

D. 1

Answer: B

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83. Let $f: R \to R$ be a function whose inverse is $\frac{x+5}{3}$. What is f(x) equal to?

A. $f(x) = 3x + 5$

B. $f(x) = 3x - 5$

C. $f(x) = 5x - 3$

D. f(x) does not exist

Answer: B

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84. Consider the following statements :

1. If $f(x) = x^2$ and $g(y) = y^3$ then f=g.

2. Identity function is not always a bijection.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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85. Let $A = \{x \in R | x \geq 0|$. A function $f: A \to A$ is defined by $f(x) = x^2$. Which one of the following is correct ?

A. The function does not have inverse

B. f is its own inverse

C. The function has an inverse but f is not its own inverse

D. None of the above

Answer: A

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86. Consider the following statement in respect of a function f(x):

1. f(x) is continuous at x =a iff $\lim_{x \to a} f(x)$ exists.

2. If f(x) is continuous at a point, then $\frac{1}{f(x)}$ is also continuous at that point.

Which of the above, statements is/are corrent?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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87. Consider the function $f(x) = \begin{cases} x^2, & x > 2 \\ 3x - 2, & x \leq 2 \end{cases}$. Which one of the following statements is correct in respect of the above function?

A. f(x) is derivable but not continuous at x=2.

B. f(x) if continuous but not derivalble at x=2.

C. f(x) is neither continuous nor derivable at x=2.

D. f(x) is continuous as well as derivable at x=2.

Answer: D

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88. Consider the following statements:

1. $\lim_{x \to 0} \sin \frac{1}{x}$ does not exist.
2. $\lim_{x \to 0} \sin \frac{1}{x}$ exists.

Which of the above statements correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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89. $\lim_{x \to 0} \frac{\sin x - \tan x}{x}$ equal to?

A. 0

B. 1

C. -1

D. $1/2$

Answer: C

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90. What is $\lim_{x \to 0} \frac{1 - \sqrt{1+x}}{x}$ equal to?

A. $1/2$

B. $-1/2$

C. 1

D. -1

Answer: A

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91. Consider the following statements:

1. The derivative where the function attains maxima or minima be zero.

2. If a function is differentiable at a point, then it must be continuous at that point.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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92. Let N be the set of natural numbers and f : N->N be a function given by f(x)=x+1 for $x \in N$.Which one of the following is correct? a. f is one-one and onto b. f is one-one but not onto c. f is only onto d. f is neither one-one nor onto

A. f is one-one and onto

B. f is one-one but not onto

C. f is only onto

D. f is neither one-one nor onto

Answer: B

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93. Let f be a function from the set of natural numbers to the set of even natural numbers given by f(x)=2x. Then f is

A. one to one but not onto

B. onto but not one-one

C. both one-one and onto

D. neither one-one nor onto

Answer: C

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94. Consider the following function :

1. $f(x) = e^x$, where $x > 0$

2. $g(x) = |x - 3|$

Which of the above functions is/are continuous ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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95. What is $\lim_{x \to 2} \frac{2 - x}{x^3 - 8}$ equal to ?

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

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

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

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

Answer: D

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96. A function $f: R \to R$ is defined as $f(x) = x^2$ for $x \geq 0, f(x) = -x$ for $x < 0.$

Consider the following statements in respect of the above function :

1. The function is continuous at x=0.

2. The function is differentiable at x=0.

Which of the above statements is /are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A

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97. What is $\lim_{x \to 0} \frac{1 - \cos x}{x}$ equal to ?

A. 0

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

C. 1

D. 2

Answer: A

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98. What is $\lim_{x \to 0} \frac{\cos x}{\pi - x}$ equal to ?

A. 0

B. π

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

D. 1

Answer: C

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99. What is $\lim_{x \to 0} \frac{\sin 2x + 4x}{2x + \sin 4x}$ equal to ?

A. 0

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

C. 1

D. 2

Answer: C

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100. Let N denote the set of all non-negative integers and Z denote the set of all integers. The function $f: Z \to N$ given by $f(x) = |x|$ is:

A. One-one but not onto

B. Onto but not one-one

C. Both one-one and onto

D. Neither one-one nor onto

Answer: B

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101. What is $\lim_{x \to 0} \frac{(1+x)^n - 1}{x}$ equal to ?

A. 0

B. 1

C. n

D. n-1

Answer: C

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102. What is $\lim_{x \to 0} \frac{x}{\sqrt{1 - \cos x}}$ equal to ?

A. $\sqrt{2}$

B. $-\sqrt{2}$

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

D. Limit does not exist

Answer: D

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103. What is $\lim_{x \to \frac{\pi}{2}} f(x) = \lim_{x \to \frac{\pi}{2}} \frac{1 - \sin x}{(\pi - 2x)^2}$ equal to ?

A. 1

B. $1/2$

C. $1/4$

D. $1/8$

Answer: D

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104. What is the value of λ if the function is continuous at $x = \frac{\pi}{2}$?

A. $1/8$

B. $1/4$

C. $1/2$

D. 1

Answer: A

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105. If $f(9) = 9$ and $f'(9) = 4$ then what is $\lim_{x \to 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 4}$ equal to?

A. 36

B. 9

C. 4

D. None of these

Answer: C

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106. Consider the following statements :

1. The function $f(x) = 3\sqrt{x}$

is continuous at all x except at x=0.

2. The function $f(x) = [x]$ is continuous at x=2.99 where [.] is the bracket function.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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107. Consider the following statements:

1. The function $f(x) = |x|$ is not differentiable at x=1.

2. The function $f(x) = e^x$ is not differentiable at x=0.

Which of the above statements is/are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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108. Let f(x) be a function defined in $1 \leq x \leq \infty$ by

$$f(x) = \begin{cases} 2 - x & \text{for} \quad 1 \leq x \leq 2 \\ 3x - x^2 & \text{for} \quad x > 2 \end{cases}$$

Consider the following statements :

1. The function is continuous at every point in the interval $(1, \infty)$.

2. The function is differentiable at x=1.5.

Which of the above statements is /are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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109. Let f(x) be a function defined in $1 \leq x \leq \infty$ by

$$f(x) = \begin{cases} 2 - x & \text{for} \quad 1 \leq x \leq 2 \\ 3x - x^2 & \text{for} \quad x > 2 \end{cases}$$

What is the differentiable coefficient of f(x) at x=3 ?

A. 1

B. 2

C. -1

D. -3

Answer: D

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110. Let f(x) be a function defined in $1 \leq x \leq \infty$ by

$$f(x) = \begin{cases} 2 - x & \text{for} \quad 1 \leq x \leq 2 \\ 3x - x^2 & \text{for} \quad x > 2 \end{cases}$$

Consider the following statements :

1. f'(2+0) does not exist.

2. f'(2-0) does not exist.

Which of the above statements is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A

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111. The function $f: N \to N, N$ being the set of of natural numbers, defined by f(x)=2x+3 is

A. injective and surjective

B. injective but not surjective

C. not injective but surjective

D. neither injective nor surjective

Answer: B

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112. If $f(x) = ax + b$ and $g(x) = cx + d$ such that $f[g(x)] = g[f(x)]$ then which one of the following is correct?

A. f(c)=g(a)

B. f(a)=g(c)

C. f(c)=g(d)

D. f(d)=g(b)

Answer: D

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113. Consider the function $f(x) = \frac{x-1}{x+1}$

What $\frac{f(x)+1}{f(x)-1}$ equal to ?

A. 0

B. 1

C. 2x

D. 4x

Answer: A

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114. Consider the function $f(x) = \frac{x-1}{x+1}$

What is f(2x) equal to ?

A. $\frac{f(x)+1}{f(x)+3}$

B. $\frac{f(x)+1}{3(x)+1}$

C. $\frac{3f(x)+1}{f(x)+3}$

D. $\frac{f(x)+3}{3f(x)+1}$

Answer: C

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115. Consider the function $f(x) = \frac{x-1}{x+1}$

What is f(f(x)) equal to ?

A. x

B. $-x$

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

D. None of these

Answer: C

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116. Consider the function $f(x) = \begin{cases} x^2 - 5 & x \leq 3 \\ \sqrt{x+13} & x > 3 \end{cases}$

What is $\lim_{x \to 3} f(x)$ equal to ?

A. 2

B. 4

C. 5

D. 13

Answer: B

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117. Consider the function $f(x) = \begin{cases} x^2 - 5 & x \leq 3 \\ \sqrt{x+13} & x > 3 \end{cases}$

Consider the following statements :

1. The function is discontinuous at x=3.

2. The function is not differentiable at x=0.

What of the above statements is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

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118. Consider the function $f(x) = \begin{cases} x^2 - 5 & x \leq 3 \\ \sqrt{x + 13} & x > 3 \end{cases}$

What is the differential coefficient of f(x) at = 12 ?

A. $5/2$

B. 5

C. $1/5$

D. $1/10$

Answer: D

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119. Consider the function

$$f(x) = \begin{cases} \tan kx, & x < 0 \\ 3x + 2k^2, & x \geq 0 \end{cases}$$

What is the non-zero value of k for which the function is continuous at x=0?

A. $1/4$

B. $1/2$

C. 1

D. 2

Answer: B

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120. Consider the following statements:

1. The function f(x)=[x] where [.] is the greatest integer function defined

on R, is continuous at all points except at x=0.

2. The function $f(x) = \sin|x|$ is continuous for all $x \in R$.

Which of the above statements is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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121. What is $\lim_{x \to 0} \frac{\log_5(1+x)}{x}$ equal to?

A. 1

B. $\log_5 e$

C. $\log_e 5$

D. 5

Answer: B

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122. What is $\lim_{x \to 0} \frac{5^x - 1}{x}$ equal to ?

A. $\log_e 5$

B. $\log_5 e$

C. 5

D. 1

Answer: A

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123. What is $\lim_{n \to \infty} \frac{1 + 2 + 3 + ... + n}{1^2 + 2^2 + 3^2 + ...n^2}$

A. 5

B. 2

C. 1

D. 0

Answer: D

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124. Given that $\lim_{x \to \infty} \left(\frac{2 + x^2}{1 + x} - Ax - B \right) = 3$

What is the value of A?

A. -1

B. 1

C. 2

D. 3

Answer: B

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125. Given that $\lim_{x \to \infty} \left(\frac{2 + x^2}{1 + x} - Ax - B \right) = 3$

What is the value of B?

A. -2

B. 3

C. -4

D. -3

Answer: C

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126. Given that $\lim_{x \to \infty} \left(\frac{2 + x^2}{1 + x} - Ax - B \right) = 3$

If $G(x) = \sqrt{25 - x^2}$ then what is $\lim_{x \to 1} \frac{G(x) - G(1)}{x - 1}$ equal to?

A. $-\frac{\sqrt{1}}{2\sqrt{6}}$

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

C. $-\frac{1}{\sqrt{6}}$

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

Answer: A

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127. Cosider the following statements: 1. f(x)=[x], where [.] is the greatest integer function, is discontinuous at x=n, where $n \in Z$.

2. $f(x) = \cot x$ is discontinuous at $x = n\pi$, where $n \in Z$.

Which of the above statements is /are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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128. If $f(x) = \log_e\left(\frac{1+x}{1-x}\right), g(x) = \frac{3x+x^3}{1+3x^2}$ and $gof(t) = g(f(t))$ then what is $g^\circ f\left(\frac{e-1}{e+1}\right)$ equal to?

A. 2

B. 1

C. 0

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

Answer: B

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129. Given a function

$$f(x) = \begin{cases} -1 & If \quad x \leq 0 \\ ax + b & If \quad 0 < x < 1 \\ 1 & If \quad x \geq 1 \end{cases}$$

where a, b are constants. The function is continuous everywhere.

What is the value of a?

A. -1

B. 0

C. 1

D. 2

Answer: D

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130. Given a function

$$f(x) = \begin{cases} -1 & If \quad x \leq 0 \\ ax + b & If \quad 0 < x < 1 \\ 1 & If \quad x \geq 1 \end{cases}$$

where a, b are constants. The function is continuous everywhere.

What is the value of b?

A. -1

B. 1

C. 0

D. 2

Answer: A

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131. Consider the following functions:

1. $f(x) = x^3, x \in \mathbb{R}$

2. $f(x) = \sin x, 0 < x < 2\pi$

3. $f(x) = e^x, x \in \mathbb{R}$

Which of the above function have inverse defined on their ranges?

A. 1 and 2 olny

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: C

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132. Consider the function

$$f(x) = \begin{cases} \frac{\alpha \cos x}{\pi - 2x} & If \quad x \neq \frac{\pi}{2} \\ 3 & If \quad x = \frac{\pi}{2} \end{cases}$$

Which is continuous at $x = \frac{\pi}{2}$ where α is a constant.

What is the value of α?

A. 6

B. 3

C. 2

D. 1

Answer: A

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133. Consider the function

$$f(x) = \begin{cases} \frac{\alpha \cos x}{\pi - 2x} & If \quad x \neq \frac{\pi}{2} \\ 3 & If \quad x = \frac{\pi}{2} \end{cases}$$

Which is continuous at $x = \frac{\pi}{2}$ where α is a constant.

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

A. 0

B. 3

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

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

Answer: D

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134. If $g(x) = \frac{1}{f(x)}$ and $f(x) = x, x \neq 0$, then which one of the following is correct

A. $f(f(f(g(g(f(x))))))) = g(g(f(g(f(x)))))$

B. $f(f(g(3(g(f(x))))))) = g(g(f(g(f(x))))))$

C. $f(g(f(g(g(f(g(x))))))) = g(g(f(g(f(x))))))$

D. $f(f(f(f(f(f(x))))))) = f(f(f(g(x))))$

Answer: B

Watch Video Solution

135. If $f(x) = sqet(25 - x^2)$, then what is $\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1}$ equal to?

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

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

C. $\sqrt{24}$

D. $-\frac{\sqrt{1}}{\sqrt{24}}$

Answer: D

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136. Consider the function

$$f(x) = \begin{cases} ax - 2 & \text{for} \quad -2 < x < -1 \\ -1 & \text{for} \quad -1 \leq x \leq 1 \\ a + 2(x-1)^2 & \text{for} \quad 1 < 1x < 2 \end{cases}$$

What is the value of a which f(x) is continuous at $x = -1$ and x=1?

A. -1

B. 1

C. 0

D. 2

Answer: A

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137. The function $f(x) = \dfrac{1 - \sin x + \cos x}{1 + \sin x + \cos x}$ is not defined at $x = \pi$.

The value of $f(\pi)$ so that f(x) is continuous at $x = \pi$ is

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

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

C. -1

D. 1

Answer: C

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138. Consider the following functions:

1. $f(x) = \begin{cases} \frac{1}{x} & \text{if} \quad x \neq 0 \\ 0 & \text{if} \quad x = 0 \end{cases}$

2. $f(x) = \begin{cases} 2x + 5 & \text{if} \quad x > 0 \\ x^2 + 2x + 5 & \text{if} \quad x \leq 0 \end{cases}$

Which of the above functions is / are derivable at x=0?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer:

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139. The domain of the function $f(x) = \frac{1}{\sqrt{|x|} - x}$ is

A. $[0, \infty)$

B. $(-\infty, 0)$

C. $[1, \infty)$

D. $(-\infty, 0]$

Answer: B

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140. Consider the following statements :

1. The function $f(x) = x^2 + 2\cos x$ is increasing in the interval $(0, \pi)$

2. The function $f(x) = 1n\left(\sqrt{1 + x^2} - x\right)$ is decreasing in the interval $(-\infty, \infty)$

Which of the above statements is/ are correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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141. If $f: IR \to IR \to IR$ be two functions given by $f(x) = 2x - 3$ and $g(x) = x^3 + 5$ than $(fog)^{-1}(x)$ is equal to

A. $\left(\frac{x+7}{2}\right)^{\frac{1}{3}}$

B. $\left(\frac{x-7}{2}\right)^{\frac{1}{3}}$

C. $\left(x-\frac{7}{2}\right)^{\frac{1}{3}}$

D. $\left(x+\frac{7}{2}\right)^{\frac{1}{3}}$

Answer:

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142. If $f(x)=\frac{\sin\left(e^{x-2}-1\right)}{1n(x-1)}$, then $\lim_{x\to 2} f(x)$ is equal to

A. -2

B. -1

C. 0

D. 1

Answer: D

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143. Consider the following statements :

Statement 1 : The function $f: IR \to IR$ such that $f(x) = x^3$ for all $x \in IR$ is one-one.

Statement 2 : $f(a) \Rightarrow f(b)$ for all $a, b \in IR$ if the function f is one-one.

Which one of the following is correct in respect of the above statements ?

A. Both the statements are true and Statement 2 is the correct explanation of Statement 1.

B. Both the statements are true and Statement 2 is not the correct explanation of Statement 1.

C. Statement 1 is true but Statement 2 is false.

D. Statement 1 is false but Statement 2 is true.

Answer: A

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144. Consider the function

$$f(x) = \begin{cases} -2\sin x & \text{if} \quad x \leq -\frac{\pi}{2} \\ A\sin x + B & \text{if} \quad -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \cos x & \text{if} \quad x \geq \frac{\pi}{2} \end{cases}$$

Which is continuous everywhere.

The value of A is

A. 1

B. 0

C. -1

D. -2

Answer: C

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145. Consider the function

$$f(x) = \begin{cases} -2\sin x & \text{if} \quad x \leq -\frac{\pi}{2} \\ A\sin x + B & \text{if} \quad -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \cos x & \text{if} \quad x \geq \frac{\pi}{2} \end{cases}$$

Which is continuous everywhere.

The value of B is

A. 1

B. 0

C. -1

D. -2

Answer: A

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146. Consider the curves

$$f(x) = x|x| - 1 \text{ and } g(x) = \begin{cases} \frac{3x}{2}, x > 0 \\ 2x, x \leq 0 \end{cases}$$

Where do the curves intersect?

A. At(2,3) only

B. At (-1,-2) only

C. At (2,3)and(-1,-2)

D. Neither at (2,3)nor at (-1,-2)

Answer: C

Watch Video Solution

147. Consider the curves

$$f(x) = x|x| - 1 \text{ and } g(x) = \begin{cases} \frac{3x}{2}, x > 0 \\ 2x, x \leq 0 \end{cases}$$

What is the area bounded by the curves?

A. $\frac{17}{6}$ square units

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

C. 2 square units

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

Answer: B

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148. Cosider the function $f(x) = |x - 1| + x^2 \quad \text{where} \quad x \in R.$

Which one of the following statements is correct?

A. f(x) is continuous but not differentiable at x=0

B. f(x) is continuous but not differentiable at x=1

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

D. f(x) is differentiable at x=0 and x=1

Answer: B

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149. Cosider the function $f(x) = |x - 1| + x^2 \quad \text{where} \quad x \in R.$

which one of the following statements is correct?

A. f(x) is increasing in $\left(-\infty, \frac{1}{2}\right)$ and decreasing in $\left(\frac{1}{2}, \infty\right)$

B. f(x) is decreasing in $\left(-\infty, \frac{1}{2}\right)$ and increasing in $\left(\frac{1}{2}, \infty\right)$

C. f(x) is increasing in $(-\infty, 1)$ and increasing in $(1, \infty)$

D. f(x) is decreasing in $(-\infty, 1)$ and increasing in $(1, \infty)$

Answer: B

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150. Which one the following statements is correct?

A. f(x) has local minima at more than one point in $(-\infty, \infty)$

B. f(x) has local maxima at moer than one point in $(-\infty, \infty)$

C. f(x) has local minimum at one point only in $(-\infty, \infty)$

D. f(x) has neither maxima nor minima in $(-\infty, \infty)$

Answer: C

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151. What is the area of the region bounded by x-asix, the curve y=f(x) and the two ordinates $x = \frac{1}{2}$ and $x = 1$?

A. $\frac{5}{12}$ square unit

B. $\frac{5}{6}$ square unit

C. $\frac{7}{6}$ square units

D. 2 square units

Answer: A

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152. What is the area of the region bounded by x-asix, the curve y=f(x) and the two ordinates $x = 1$ and $x = \frac{3}{2}$?

A. $\frac{5}{12}$ square unit

B. $\frac{7}{12}$ square unit

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

D. $\frac{11}{12}$ square unit

Answer: D

Watch Video Solution

153. Consider the equation $x + |y| = 2y$.

Which of the following statements are not correct?

yas a function of x is not defined for all real x.

yas a function of x is not continuous at x=0.

yas a function of x is differentiable for all x.

Select the correct answer using the code given below.

A. 1 and 2 olny

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: D

Watch Video Solution

154. Consider the equation $x + |y| = 2y$.

What is the derivative of y as a function of x with respect to x for $x < 0$?

A. 2

B. 1

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

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

Answer: D

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155. Consider the function $f(x) = (x-1)^2(x+1)(x-2)^3$

What is the number of point of local minima of the function f(x)?

A. None

B. One

C. Two

D. Three

Answer: C

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156. Consider the function $f(x) = (x-1)^2(x+1)(x-2)^3$

What is the number of point of local maxima of the function f(x)?

A. None

B. One

C. Two

D. Three

Answer: C

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157. Consider the function $f(x) = \frac{a^{[x]+x} - 1}{[x] + x}$ where [.] denotes the greatest integer function.

What is $\lim_{x \to 0^+} f(x)$ equal to?

A. 1

B. In a

C. $1 - a^{-1}$

D. Limit does not exist

Answer: B

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158. Consider the function $f(x) = \frac{a^{[x]+x} - 1}{[x] + x}$ where [.] denotes the greatest integer function.

What is $\lim_{x \to 0^-} (f(x)$ equal to?

A. 0

B. In a

C. $1 - a^{-1}$

D. Limit does not exist

Answer: C

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159. A function f(x) is defined as follows:

$$f(x) = \begin{cases} x + \pi & \text{for} \quad x \in [-\pi, 0) \\ \pi \cos x & \text{for} \quad x \in \left[0, \frac{\pi}{2}\right] \\ \left(x - \frac{\pi}{2}\right)^2 & \text{for} \quad x \in \left(\frac{\pi}{2}, \pi\right] \end{cases}$$

Consider the following statements :

1. The function f(x) is continuos at x=0.

2. The function f(x) is continuous at $x = \frac{\pi}{2}$.

Which of the above statements is/are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

Watch Video Solution

160. A function f(x) is defined as follows:

$$f(x) = \begin{cases} x + \pi & \text{for} \quad x \in [-\pi, 0) \\ \pi \cos x & \text{for} \quad x \in \left[0, \frac{\pi}{2}\right] \\ \left(x - \frac{\pi}{2}\right)^2 & \text{for} \quad x \in \left(\frac{\pi}{2}, \pi\right] \end{cases}$$

Consider the following statements :

1. The function f(x) is differentiable at x=0.

2. The function f(x) is differentiable at $x = \frac{\pi}{2}$.

Which of the above statements is /aer correct ?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

Watch Video Solution

161. Let f(x) be the greatest integer function and g(x) be the modulus function.

What is $(gof)\left(-\frac{5}{3}\right)-(fog)\left(-\frac{5}{3}\right)$ equal to?

A. -1

B. 0

C. 1

D. 2

Answer: C

Watch Video Solution

162. Let f(x) be the greatest integer function and g(x) be the modulus function.

What is $(f \circ f)\left(-\frac{9}{5}\right) - (g \circ g)(-2)$ equal to?

A. -1

B. 0

C. 1

D. 2

Answer: B

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163. If $\lim_{x \to 0} \phi(x) = a^2$, where $a \neq 0$, then what is $\lim_{x \to 0} \phi\left(\frac{x}{a}\right)$ equal to?

A. a^2

B. a^{-2}

C. $-a^2$

D. $-a$

Answer: A

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164. What is $\lim_{x \to 0} e^{\frac{1}{x^2}}$ equal to?

A. 0

B. 1

C. -1

D. Limit does not exist

Answer: A

Watch Video Solution

165. What is the domain of the function $f(x) = \frac{1}{\sqrt{|x| - x}}$?

A. $(-\infty, 0)$

B. $(0, \infty)$

C. $0 < x < 1$

D. $x > 1$

Answer: A

Watch Video Solution

166. Consider the following in respect of the function

$$f(x) = \begin{cases} 2 + x, x \geq 0 \\ 2 - x, x < 0 \end{cases}$$

1. $\lim_{x \to 1} f(x)$ does not exist.

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

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

Which of the above statements is /aer correct?

A. 1 only

B. 3 olny

C. 2 and 3 only

D. 1 and 3 only

Answer: B

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167. Let $f: A \to R$, where $A = R\{0\}$ is such that $f(x) = \frac{x + |x|}{x}$ On which one of the following sets is f(x) continuous?

A. A

B. $B = \{x \in R: x \geq 0\}$

C. $C = \{x \in R: x \leq 0\}$

D. D=R

Answer: A

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168. $f(x) = \begin{cases} 3x^2 + 12x - 1 & -1 \leq x \leq 2 \\ 37 - x, & 2 < x \leq 3 \end{cases}$

Which of the following statements is /are correct?

1. f(x) is increasing in the interval [-1,2].

2. f(x) is decreasing in the interval (2,3].

Select the correct answer using the code given below:

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

Watch Video Solution

169. Let $f(x) = \begin{cases} -2, & -3 \leq x \leq 0 \\ x-2, & 0 < x \leq 3 \end{cases}$ and $g(x) = f(|x|) + |f(x)|$

Which of the following statement is correct ? g(x) is differentiable at x=0

g(x) is differentiable at x=2

A. 1 olny

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

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170. Let $f(x) = [x]$, where [.] is the greatest integer function and $g(x) = \sin x$ be two real valued functions over R.

Which of the following statements is correct?

A. Both f(x) and g(x) are continuous at x=0

B. f(x) is continuous at x=0, but g(x) is not continuous at x=0.

C. g(x) is continuous at x=0, but f(x) is not continuous at x=0.

D. Both f(x) and g(x) are discontinuous at x=0.

Answer: C

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171. Let $f(x) = [x]$, where [.] is the greatest integer function and $g(x) = \sin x$ be two real valued functions over R.

Which one of the following statements is correct?

A. $\lim_{x \to 0} (fog)(x)$ exists

B. $\lim_{x \to 0} (gof)(x)$ exists

C. $\lim_{x \to 0+} (fog)(x) = \lim_{x \to 0-} (gof)(x)$

D. $\lim_{x \to 0+} (fog)(x) = \lim_{x \to 0+} (gof)(x)$

Answer: D

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172. Let $f(x) = [x]$, where [.] is the greatest integer function and $g(x) = \sin x$ be two real valued functions over R.

Which of the following statements is correct?

1. (fof)(x)=f(x).

2. (gog)(x)=g(x) only when x=0.

3. (go(fog))(x) con take only three values.

Select the correct answer using the code given below:

A. 1 and 2 olny

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: C

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173. Let $f(x) = \begin{cases} \frac{e^x - 1}{x}, & x > 0 \\ 0, & x = 0 \end{cases}$ be a real valued function.

Which one of the following statements is correct?

A. f(x) is a strictly decreasing function in (0,x),

B. f(x) is a strictly increasing function in (0,x),

C. f(x) is neither increasing nor decreasing in (0,x)

D. f(x) is not decreasing in (0,x).

Answer: B

Watch Video Solution

174. Let $f(x) = \begin{cases} \frac{e^x - 1}{x}, & x > 0 \\ 0, & x = 0 \end{cases}$ be a real valued function.

Which of the following statements is/are correct?

1. f(x) is right continuous at x=0.

2. f(x) is discontinuous at x=1.

Seletct the correct answer using the code given below.

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

Watch Video Solution

175. Let $f(x) = \begin{cases} -2, & -3 \leq x \leq 0 \\ x-2, & 0 < x \leq 3 \end{cases}$ and $g(x) = f(|x|) + |f(x)|$

Which of the following statement is/are correct?

1. g(x) is differentiable x=0.

g(x) is differentiable at x=2.

Select the correct aswer using the code given below:

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: D

Watch Video Solution

176. Let $f(x) = \begin{cases} -2, & -3 \leq x \leq 0 \\ x-2, & 0 < x \leq 3 \end{cases}$ and $g(x) = f(|x|) + |f(x)|$

What is the value of the differential coefficient of g(x) at x=-2?

A. -1

B. 0

C. 1

D. 2

Answer: B

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177. Let $f(x) = \begin{cases} -2, & -3 \leq x \leq 0 \\ x-2, & 0 < x \leq 3 \end{cases}$ and $g(x) = f(|x|) + |f(x)|$

What is the value of differential coefficent of g(x) at x=-2

A. -1

B. 0

C. 1

D. 2

Answer: B

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178. What is $\lim_{x \to 0} \frac{e^x - (1+x)}{x^2}$ equal to?

A. 0

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

C. 1

D. 2

Answer: B

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179. The function $f: X \to Y$ defined by $f(x) = \cos x$ where $x \in X$, is one-one and onto if X and Y are respectively equal to

A. $[0, \pi]$ and $[-1, 1]$

B. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ and $[-1, 1]$

C. $[0, \pi]$ and $(-1, 1)$

D. $[0, \pi]$ and $[0, 1]$

Answer: A

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180. If $f(x) = \frac{x}{x-1}$, then what is $\frac{f(a)}{f(a+1)}$ equal to?

A. $f\left(-\frac{a}{a+1}\right)$

B. $f(a^2)$

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

D. $f(-a)$

Answer: B

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181. Let $f:[-6,6] \to R$ be defined by $f(x) = x^2 - 3$. Consider the following :

1. $(f \circ f \circ f)(-1) = (f \circ f \circ f)(1)$

Which of the above is /are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: C

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182. Let $f(x) = px + q$ and $g(x) = mx + n$. Then $f(f(x)) = g(f(x))$ is equivalent to

A. $f(p) = g(m)$

B. $f(q) = g(n)$

C. $f(n) = g(q)$

D. $f(m) = g(p)$

Answer: C

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183. If $F(x) = \sqrt{9 - x^2}$, then what is $\lim_{x \to 1} \frac{F(x) - F(1)}{x - 1}$ equal to?

A. $-\frac{1}{4\sqrt{2}}$

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

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

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

Answer: C

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184. If $f(x) = \{x,$ when x is rational and $0,$ when x is irrational $g(x) = \{0,$ when x is rational and $x,$ when x is irrational then $(f - g)$ is

A. one-one and into

B. neither one-one nor onto

C. many-one and onto

D. one-one and onto

Answer: D

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185. Let f(x) be defined as follows :

$$f(x) = \begin{cases} 2x+1, & -3 < x < -2 \\ x-1, & -2 \leq x < 0 \\ x+2, & 0 \leq x < 1 \end{cases}$$

Which one of the following statements is correct in respect of the above function?

A. It is discontinuous at x=-2 but continuous at every other point.

B. It is continuous only in the interval (-3,-2).

C. It is discontinuous at x=0 but continuous at every other point.

D. It is discontinuous at every point.

Answer: C

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186. Consider the following statements :

1. If $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist, then $\lim_{x \to a} \{f(x)g(x)\}$ exists.

2. If $\lim_{x \to a} \{f(x)g(x)\}$ exists, then both $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ must exist.

Which of the above statements is /are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: A

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187. Let $f(a) = \frac{a-1}{a+1}$

Consider the following :

1. $f(2a) = f(a) + 1$

2. $f\left(\frac{1}{a}\right) = -f(a)$

Which of the above is /are correct?

A. 1 only

B. 2 only

C. Both 1 and 2

D. Neither 1 nor 2

Answer: B

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188. Suppose the function $f(x) = x^n, n \neq 0$ is differentiable for all x. Then n can be any element of the interval

A. $(1, \infty)$

B. $(0, \infty)$

C. $\left(\frac{1}{2}, \infty\right)$

D. None of the above

Answer: A

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189. The inverse of the function $y = 5^{Inx}$ is

A. $x = y^{\frac{1}{In5}}, y > 0$

B. $x = y^{In5}, y > 0$

C. $x = y^{\frac{1}{In5}}, y < 0$

D. $x = 5 \ \text{In} \ y, y > 0$

Answer: A

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190. A function is defined as follows :

$$f(x) = \begin{cases} -\frac{x}{\sqrt{x^2}}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

Which one of following is correct in respect of the above function?

A. f(x) is continuous at x=0 but not differentiable at x=0

B. f(x) is continuous as well as differentiable at x=0

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

D. None of the above

Answer: C

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191. Consider the following :

1. $x + x^2$ is continuous at x=0

2. $x + \cos\left(\frac{1}{x}\right)$ is discontinuous at x=0

3. $x^2 + \cos\left(\frac{1}{x}\right)$ is continuous at x=0`

Which of the above are correct?

A. 1 and 2 olny

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: A

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192. A function is defined in $(0, \infty)$ by

$$f(x) = \begin{cases} 1 - x^2 & \text{for} \quad 0 < x \leq 1 \\ In \quad x & \text{for} \quad 1 < x \leq 2 \\ In \quad 2 - 1 + 0.5x & \text{for} \quad 2 < x < \infty \end{cases}$$

Which one of the following is correct in respect of the derivative of the function, i.e., f'(x)?

A. $f'(x) = 2x \quad \text{for} \quad 0 < x \leq 1$

B. $f'(x) = -2x \quad \text{for} \quad 0 < x \leq 1$

C. $f'(x) = -2x \quad \text{for} \quad 0 < x < 1$

D. $f'(x) = 0 \quad \text{for} \quad 0 < x < \infty$

Answer: C

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193. Consider the following statements :

1. Derivative of f(x) may not exist at some point.

2. Derivative of f(x) may exist finitely at some point.

3. Derivative of f(x) may be infinite (geometircally) at some point.

Which of the above statements are correct?

A. 1 and 2 olny

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Answer: D

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194. The function $f(x) = |x| - x^3$ is

A. odd

B. even

C. both even and odd

D. neither even nor odd

Answer: D

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195. If $l_1 = \frac{d}{dx}\left(e^{\sin x}\right)$

$l_2 \lim_{h \to 0} \frac{e^{\sin(x+h)} - e^{\sin x}}{h}$

$l_3 = \int e^{\sin x} \cos x dx$

then which one of the following is correct?

A. $l_1 \neq l_2$

B. $\frac{d}{dx}(l_3) = l_2$

C. $\int l_3 dx = l_2$

D. $l_2 = l_3$

Answer: B

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196. If $\lim_{x \to \frac{\pi}{2}} \frac{\sin x}{x} = l$ and $\lim_{x \to \infty} \frac{\cos x}{x} = m$, then which one of the following is correct?

A. $l = 1, m = 1$

B. $l = \frac{2}{\pi}, m = \infty$

C. $l = \frac{2}{\pi}, m = 0$

D. $l = 1, m = \infty$

Answer: C

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197. If x is any real number, then $\frac{x^2}{1+x^4}$ belongs to which one of the following intervals?

A. (0,1)

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

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

D. [0,1]

Answer: B

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198. The left hand derivative of $f(x) = [x]\sin(\pi x)$ at $x = k$, k is an integer, is

A. $(-1)^k(k-1)\pi$

B. $(-1)^{k-1}(k-1)\pi$

C. $(-1)^k k\pi$

D. $(-1)^{k-1}k\pi$

Answer: A

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199. Indicate all correct alternatives if, $f(x) = \frac{x}{2} - 1$, then on the interval $[0, \pi]$

A. $\tan[f(x)]$ where $[.]$ is the greatest integer function, and $\frac{1}{f(x)}$ are both continuous.

B. $\tan[f(x)]$, where [.] is the greatest integer function, and $f^{-1}(x)$ are both continuous.

C. $\tan[f(x)]$, where [.] is the greatest integer function, and $\frac{1}{f(x)}$ are both discontinuous.

D. $\tan[f(x)]$ where [.] is the greatest integer function, is discontinuous but $\frac{1}{f(x)}$ is continuous.

Answer: C

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200. The set of all points where the function $f(x) = \sqrt{1 - e^{-x^2}}$ is differentiable is

A. $(0, \infty)$

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

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

D. $(-1, \infty)$

Answer: C

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201. If $f(x) = x\left(\sqrt{x} + \sqrt{(x+1)}\right.$, then

A. continuous but not differentiable at x=0

B. differentiable at x=0

C. not continuous at x=0

D. None of the above

Answer: B

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202. Which one the following graph represents the function $f(x) = \frac{x}{x}, x \neq 0$?

A. 

B. 

C. 

D. None of the above

Answer: C

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203. Let g be the greatest integer function. Then the function $f(x) = (g(x))^2 - g(x)$ is discontinuous at

A. all integers

B. all integers except 0 and 1

C. all integers except 0

D. all integers except 1

Answer: D

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204. Consider the following statements :

Statement I :

$x > \sin x \quad \text{for all} \quad x > 0$

Statement II : $f(x) = x \sin x$ is an increasing function for all $x > 0$

Which one of the following is correct in respect of the above statements?

A. Both Statement I and Statement II are true and Statemenet II is the correct explanation of Statement II.

B. Both Statement I and Statement II are true and Statement II is not the correct explanation of Statement I.

C. Statement I is true but Statement II is false

D. Statement I is false but Statement II is true

Answer: A

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205. If $f(x) = \frac{4x + x^4}{1 + 4x^3}$ and $g(x) = In\left(\frac{1+x}{1-x}\right)$, then what is the value of $f^{\circ}g\left(\frac{e-1}{e+1}\right)$ equal to?

A. 2

B. 1

C. 0

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

Answer: B

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206. Which one of the following is correct in respect of the function $f: \mathbb{R} \to \mathbb{R}^+$ defined as $f(x) = |x + 1|$?

A. $f(x)^2 = [f(x)]^2$

B. $f(|x|) = |f(x)|$

C. $f(x+y) = f(x) + f(y)$

D. None of the above

Answer: D

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207. Suppose $f: \mathbb{R} \to \mathbb{R}^+$ is defined by $f(x) = \frac{x^2}{1+x^2}$. What is the range of the function?

A. $[0, 1)$

B. $[0, 1]$

C. $(0, 1]$

D. $(0, 1)$

Answer: A

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208. If $f(x) = |x| + |x - 1|$, then which one of the following is correct?

A. f(x) is continuous at x=0 and x=1

B. f(x) is continuous at x=0 but not at x=1

C. f(x) is continuous at x=1 but not at x=0

D. f(x) is neither continuous at x=0 nor at x=1

Answer: A

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209. Conisder the function $f(x) = \begin{cases} x^2 \ln|x| & x \neq 0 \\ 0 & x = 0 \end{cases}$. What is f'(0) equal to?

A. 0

B. 1

C. -1

D. It does not exist

Answer: A

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210. If $f(x) = \frac{x^2 - 9}{x^2 - 2x - 3}, x \neq 3$ is continuous at x=3, then which one of the following is correct?

A. f(3)=0

B. f(3)=1.5

C. f(3)=3

D. f(3)=-1.5

Answer: B

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211. If $f: \mathbb{R} \to S$ defined by $f(x) = 4\sin \times -3\cos x + 1$ is onto, then what is S equal to?

A. $[-5, 5]$

B. $(-5, 5)$

C. $(-4, 6)$

D. $[-4, 6]$

Answer: D

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212. For f to be a function, what is the domain of f, if $f(x) = \frac{1}{\sqrt{|x| - x}}$?

A. $(-\infty, 0)$

B. $(0, \infty)$

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

D. $(-\infty, 0]$

Answer: A

Watch Video Solution

213. What is $\lim_{x \to 0} \frac{\tan x}{\sin 2x}$ equal to?

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

B. 1

C. 2

D. Limit does not exist

Answer: A

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214. What is $\lim_{h \to 0} \frac{\sqrt{2x + 3h} - \sqrt{2}x}{2h}$ equal to?

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

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

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

D. $\frac{3}{4\sqrt{2}x}$

Answer: D

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215. If $f(x)$ is an even function, then write whether $f'(x)$ is even or odd.

A. f'(x) is an even function

B. f'(x) is an odd function

C. f'(x) may be an even or odd function depending on the type of function

D. f'(x) is a constant function

Answer: B

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216. Let $A = (X \in R: -1 \leq x \leq 1)$ and S be the subset of $A \times B$, defined by $S = \left[(x, y) \in A \times B: x^2 + y^2 = 1\right]$

Which one of the following is correct?

A. S is a one-one function from A inot B

B. S is a many-one function from A inot B

C. S is a bijective mapping from A into B

D. S is not a function

Answer: D

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217. If $f(x) = \frac{\sqrt{x-1}}{x-4}$ defines a function of R, then what is its domain?

A. $(-\infty, 4) \cup (4, \infty)$

B. $[4, \infty]$

C. $(1, 4) \cup (4, \infty)$

D. $[1, 4) \cup (4, \infty)$

Answer: D

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218. Consider the function

$$f(x) = \begin{cases} \frac{\sin 2x}{5x} & \text{if} \quad x \neq 0 \\ \frac{2}{15} & \text{if} \quad x = 0 \end{cases}$$

Which one of the following is correct in respect of the function?

A. It is not continuous at x=0

B. It is continuous at every x

C. It is not continuous at $x = \pi$

D. It is continuous at x=0

Answer: A

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219. For the function $f(x) = |x - 3|$, which of the following is not correct?

A. The function is not continuous at x=3

B. The function is continuous at x=3

C. The function is differentiable at x=0

D. The function is differentiable at x=-3

Answer: A

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220. If the function $f9x\Big) = \dfrac{2x - \sin^{-1} x}{2x + \tan^{-1} x}$ is continuous at each point of its domain, then the value of $f(0)$ 2 (b) $\dfrac{1}{3}$ (c) $-\dfrac{1}{3}$ (d) $\dfrac{2}{3}$

A. $-\dfrac{1}{3}$

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

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

D. 2

Answer: B

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221. If $f(x) = \sqrt{25 - x^2}$, then what is $\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1}$ equal to

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

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

C. $-\frac{1}{4\sqrt{3}}$

D. $\frac{1}{4\sqrt{3}}$

Answer: A

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222. What is $\lim_{\theta \to 0} \frac{\sqrt{1-\cos\theta}}{\theta}$ equal to?

A. $\sqrt{2}$

B. $2\sqrt{2}$

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

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

Answer: C

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223. A function $f: A \to R$ is defined by the equation $f(x) = x^2 - 4x + 5$

where A=(1,4). What is the range of the function?

A. (2,5)

B. (1,5)

C. [1,5)

D. [1,5]

Answer: C

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224. In which one of the following intervals is the function $f(x) = x^2 - 5x + 6$ decreasing?

A. $(-\infty, 2]$

B. $[3, \infty]$

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

D. (2,3)

Answer: A

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225. Let

$f(x+y)=f(x)f(y)$ and $f(x)=1+xg(x)\phi(x)$ where $\lim_{x\to 0} g(x)=a$

. Then what is f(x) equal to?

A. $1+anf(x)$

B. $1+ab$

C. ab

D. abf(x)

Answer: D

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226. What is $\lim_{x\to \frac{\pi}{6}} \frac{2\sin^2 x+\sin x-1}{2\sin^2 x-3\sin x+1}$ to?

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

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

C. -2

D. -3

Answer: D

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227. A function f defined by $f(x) = In\left(\sqrt{x^2+1}-x\right)$ is

A. an even function

B. an odd function

C. Both even and odd function

D. Neither even nor odd function

Answer: B

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228. The domain of the function f defined by $f(x) = \log_x 10$ is

A. $x > 10$

B. $x > 0$ excluding x=10

C. $x \geq 10$

D. $x > 0$ excluding x=1

Answer: D

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229. $\lim_{x \to \infty} \frac{1 - \cos^3 4x}{x^2}$ is equal to

A. 0

B. 12

C. 24

D. 36

Answer: C

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230. If $f(x) = 3^{1+x}$, then $f(x)f(y)f(z)$ is equal to

A. $f(x+y+z)$

B. $f(x+y+z+1)$

C. $f(x+y+z+2)$

D. $f(x+y+z+3)$

Answer: C

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231. The domain of the function $f(x) = \sqrt{(2-x)(x-3)}$ is

A. $(0, \infty)$

B. $[0, \infty]$

C. $[2, 3]$

D. $(2, 3)$

Answer: C

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232. The value of k which makes

`f(x)={{:(sinx,xne0),(k,x=0):}"continuous at x=0,is"

A. 2

B. 1

C. -1

D. 0

Answer: D

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