MATHS

BOOKS - CENGAGE PUBLICATION

FUNCTIONS

Single Correct Answer Type

1. If $f(x) = x^5 + 1$, then find $f^{-1}(x)$.

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2. If $f(x) = x^2 - 4x + 4$, then find $f^{-1}(x)$.

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3. If $f(x) = x^4 + 1$, then find $f^{-1}(x)$.

4. If $f(x) = x^3 + 4$, then find $f^{-1}(x)$.

5. If $f(x) = x^5 - 3x^3 + 1$, then find $f(-1)$.

6. If $f(x) = 3x^2 - x + 1$, then find $f(-2)$.

7. If $f(x) = x^2 - 2x + 5$, then find $f(1)$.

8. If $f(x) = 3x^4 - 5x^3 + 7$, then find $f(-1)$

9. If $f(x) = x^2 - 5x + 3$, then find $f(x+1)$

10. If $f(x) = 3x^2 + 2x + 1$, then find $f(x-1)$

11. If $f(x) = 3x^2 - 5x + 7$, then find $f(x-1)$

12. If $f(x) = x^2 - 6$, then find $f^{-1}(x)$.

13. If $f(x) = x^2 + 3$, then find $f^{-1}(x)$

14. If $f(x) = x^2 + 2x + 1$, then find $f^{-1}(x)$

15. If $f(x) = 5x^2$, then find $f^{-1}(x)$.

16. If $f(x) = x^2 - 3x + 1$, then find $f(-2)$

17. If $f(x) = x^2 - 3x + 1$, then find $f(1)$.

18. If $f(x) = x^3 - 4x + 1$, then find $f(0)$.

19. If $f(x) = (x - 1)^2 - x + 1$, then find $f(0)$.

20. If $f(x) = x^2 - 3x + 1$, then find $f(0)$.

21. Period of $f(x) = \sin 3x \cos[3x] - \cos 3x \sin[3x]$ (where[] denotes the greatest integer function), is

A. $1/6$

B. $2/3$

C. $5/6$

D. $1/3$

Answer: D

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22. What is the fundamental period of $f(x) = \dfrac{\sin x + \sin 3x}{\cos x + \cos 3x}$

A. $\pi/2$

B. π

C. 2π

D. 3π

Answer: B

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23. If $f: R \to R$ is a function satisfying the property $f(x+1) + f(x+3) = 2$ for all $x \in R$ than f is

A. periodic with period 3

B. periodic with period 4

C. non periodic

D. periodic with period 5

Answer: B

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24. Period of $f(x) = sgn([x] + [-x])$ is equal to (where [.] denotes greatest integer function

A. 1

B. 2

C. 3

D. does not exist

Answer: A

25. If $F(x)$ and $G(x)$ are even and odd extensions of the functions $f(x) = x|x| + \sin|x| + xe^x$, where $x \in (0, 1)$, $g(x) = \cos|x| + x^2 - x$, is where $x \in (0, 1)$ respectively to the ars interval $(-1, 0)$ then $F(x) + G(x)$ in $(-1, 0)$ is

A. $\sin x + \cos x + xe^{-x}$

B. $-\left(\sin x + \cos x + xe^{-x}\right)$

C. $-\left(\sin x + \cos x + x + xe^{-x}\right)$

D. $-\left(\sin x + \cos x + x^2 + xe^{-x}\right)$

Answer: C

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26. Let $P(x) = x^{10} + a_2 x^8 + a_3 x^6 + a_4 x^4 + a_5 x^2$ be a polynomial with real coefficients. If $P(1) = 1$ and $P(2) = -5$, then the minimum-number of distinct real zeroes of $P(x)$ is

A. 5

B. 6

C. 7

D. 8

Answer: A

27. Let $f: R \to [1, \infty)$ be defined as $f(x) = \log_{10}\left(\sqrt{3x^2 - 4x + k + 1} + 10\right)$ If f(x) is surjective then k =

A. $k = \dfrac{1}{3}$

B. $k < \dfrac{1}{3}$

C. $k > \dfrac{1}{3}$

D. $k = 1$

Answer: A

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28. about to only mathematics

A. injective but not surjective

B. injective as well as surjective

C. neither injective nor surjective

D. surjective but injective

Answer: B

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29. about to only mathematics

    A. a bijection

    B. one-one but not onto

    C. onto but not one-one

    D. neither one-one nor onto

Answer: A

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30. $f : R \rightarrow R$ defined by $f(x) = \dfrac{1}{2} x|x| + \cos + 1$ is

    A. one-one and onto

B. one-one and into

C. many-one and onto

D. many-one and into

Answer: A

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31. about to only mathematics

A. $[1, 4]$

B. $[-2, 3]$

C. $(0, 3]$

D. $[2, 5\}$

Answer: C

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32. Let $f: R \to \left(0, \dfrac{2\pi}{3}\right]$ defined as $f(x) = \cot^{-1}(x^2 - 4x + \alpha)$ Then the smallest integral value of α such that, $f(x)$ is into function is

A. 2

B. 4

C. 6

D. 8

Answer: B

33. about to only mathematics

A. many-one and onto

B. many-one and into

C. one-one and onto

D. one-one and into

Answer: B

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34. Which of the following statements are incorrect? I. If $f(x)$ and $g(x)$ are one-one then $f(x) + g(x)$ is also one-one. II. If $f(x)$ and $g(x)$ are one-one then $f(x)g(x)$ is also one-one. III. If $f(x)$ is odd then it is necessarily one-one? $I and II only$ b. $II and III only$ c. $III and I only$ d. $I, II and III$

A. I and II only

B. II and III only

C. III and I only

D. I, II and III

Answer: D

35. Which of the following functions is one-one ? (1) $f: R \to R$ defined as

$f(x) = e^{sgnx} + e^{x^2}$ (2) $f: [-1, \infty) \to (0, \infty)$ defined   by

$f(x) = e^{x^2 + |x|}$ (3) $f: [3, 4] \to [4, 6]$ defined   by

$f(x) = |x - 1| + |x - 2| + |x - 3| + x - 4|$

(4) $f(x) = \sqrt{\ln(\cos(\sin x))}$

A. $f: R \to R$ denined as $f(x) = d^{\text{sgn x}} + d^{x^2}$

B. $f: [-1, \infty) \to (0, \infty)$ defined by $f(x) = e^{x^2 + |x|}$

C.

    $f: [3, 4] \to [4, 6]$ defined by $f(x) = |x - 1| + |x - 2| + |x - 3| + |$

D. $f(x) = \sqrt{\ln(\cos(\sin x))}$

Answer: C

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36. about to only mathematics

A. − 1

B. 0

C. 1

D. 100

Answer: D

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37. If $f(x) = x^2 + x + \dfrac{3}{4}$ and $g(x) = x^2 + ax + 1$ be two real functions, then the range of a for which $g(f(x)) = 0$ has no real solution is $(-\infty, -2)$ b. $(-2, 2)$ c. $(-2, \infty)$ d. $(2, \infty)$

A. $(-\infty, -2)$

B. $(-2, 2)$

C. $(-2, \infty)$

D. $(2, \infty)$

Answer: C

38. If domain of $f(x)$ is $[1, 3]$, then the domain of $f\left(\log_2\left(x^2 + 3x - 2\right)\right)$ is

A. $[-5, -4] \cup [1, 2]$

B. $[-13, -2] \cup \left[\dfrac{3}{5}, 5\right]$

C. $[4, 1] \cup [2, 7]$

D. $[-3, 2]$

Answer: A

39. Let $f(x) = \dfrac{x}{1 + x}$ and $g(x) = \dfrac{rx}{1 - x}$. Let S be the set of all real numbers r , such that f(g(x))=g(f(x)) for infinitely many real numbers x. The number of elements in set S is

A. 1

B. 2

C. 3

D. 5

Answer: B

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40. Let $f(x) = \dfrac{ax + b}{cx + d}$. Then the $fof(x) = x$, provided that :

$(a \neq 0, b \neq 0, c \neq 0, d \neq 0)$

A. $d = -a$

B. $d = a$

C. $a = b = 1$

D. $a = b = c = d = 1,$

Answer: A

41. If $f: R \to R$, $f(x) = x^3 + 3$,and $g: R \to R, g(x) = 2x + 1$, then $f^{-1}(g^{-1}(23))$ equals

A. 2

B. 3

C. $(14)^{1/3}$

D. $(15)^{1/3}$

Answer: A

42. If $f(x) = x(x-1)$ is a function from $\left[\frac{1}{2}, \infty\right) \to \left[-\frac{1}{4}, \infty\right)$, then $\{x \in r: f^{-1}(x) = f(x)\}$ is a. null set b. $\{0, 2\}$ c. $\{2\}$ d. a set containing 3 elements

A. null set

B. $\{0, 2\}$

C. $\{2\}$

D. a set containing 3 elements

Answer: C

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43. Let $a > 1$ be a real number and $f(x) = \log_a x^2$ for $x > 0$. If f^{-1} is the inverse function of f and b and c are real numbers then $f^{-1}(b + c)$ is equal to

A. $f^{-1}(b).\, f^{-1}(c)$

B. $f^{-1}(b) + f^{-1}(c)$

C. $\dfrac{1}{f(b + c)}$

D. $\dfrac{1}{f^{-1}(b) + f^{-1}(c)}$

Answer: A

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44. If the function $f(x) = \{x + 1$ if $x \leq 1$, $2x + 1$ if $1 < x \leq 2$ and $g(x) = \{x^2$ if $-1 \leq x \leq 2$, $x + 2$ if $2 \leq x \leq 3$ then the number of roots of the equation $f(g(x)) = 2$

A. 4

B. 3

C. 2

D. 1

Answer: C

45. Suppose $f(x) = ax + b$ and $g(x) = bx + a$, where a and b are positive integers. If $f(g(20)) - g(f(20)) = 28$, then which of the following is not true? a. $a = 15$ b. $a = 6$ c. $b = 14$ d. $b = 3$

A. $a = 15$

B. $a = 6$

C. $b = 14$

D. $b = 3$

Answer: D

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46. If $f(x)$ is an invertible function and $g(x) = 2f(x) + 5$, then the value of $g^{-1}(x)$ is (a)$2f^{-1}(x) - 5$ (b) $\dfrac{1}{2f^{-1}(x) + 5}$ (c) $\dfrac{1}{2}f^{-1}(x) + 5$ (d) $f^{-1}\left(\dfrac{x - 5}{2}\right)$

A. $2f^{-1}(x) - 5$

B. $\dfrac{1}{2f^{-1}(x) + 5}$

C. $\dfrac{1}{2}f^{-1}(x) + 5$

D. $f^{-1}\left(\dfrac{x-5}{2}\right)$

Answer: D

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47. If $f(x) = \begin{cases} -x + 1, & x \leq 0 \\ -(x-1)^2, & x \geq 1 \end{cases}$,then the number of solutions of

$f(x) - f^{-1}(x) = 0$ is

A. 0

B. 2

C. 3

D. 4

Answer: D

48. about to only mathematics

A. -1

B. 0

C. 1

D. none of these

Answer: B

49. If $f(x^2 - 6x + 6) + f(x^2 - 4x + 4) = 2x, \ \forall x \in R$ then $f(-3) + f(9) - 5f(1) = $? (A) 7 (B) 8 (C) 9 (D) 10

A. 7

B. 8

C. 9

D. 10

Answer: C

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50. about to only mathematics

A. 1

B. 3

C. -1

D. none of these

Answer: C

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51. If $f: R \to R$ is a function satisfying $f(x + y) = f(xy)$ for all x, y in R

and $f\left(\dfrac{3}{4}\right) = \dfrac{3}{4}$, then $f\left(\dfrac{9}{16}\right)$ is a. $\dfrac{3}{4}$ b. $\dfrac{9}{16}$ c. $\dfrac{\sqrt{3}}{2}$ d. 0

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

B. $\dfrac{9}{16}$

C. $\dfrac{\sqrt{3}}{2}$

D. 0

Answer: A

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52. A function $f: R \to R$ satisfy the equation $f(x)f(y) - f(xy) = x + y$

for all $x, y \in R$ and $f(y) > 0$, then

A. $f(x)f^{-1}(x) = x^2 - 4$

B. $f(x)f^{-1}(x) = x^2 - 6$

C. $f(x)f^{-1}(x) = x^2 - 1$

D. none of these

Answer: C

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53. Let f be a function defined from $R^+ \to R^+$. If $(f(xy))^2 = x(f(y))^2$ for all positive numbers x and y, If $f(2) = 6$, find $f(50)$=?

A. 20

B. 30

C. 5

D. 40

Answer: B

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54. Suppose f is a real function satisfying $f(x + f(x)) = 4f(x)$ and $f(1) = 4$. Then the value of $f(21)$ is 16 21 64 105

A. 16

B. 64

C. 4

D. 44

Answer: B

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55. The graph of a function $y = g(x)$ is shown in the following figure. If $f(x) = -3x^2 - kx - 12, k \in R$ and $f(g(x)) > 0 \forall x \in R$ then lest integral value of k is equal to a. b. c. d.

A. 13

B. 14

C. 15

D. 16

Answer: C

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56. Let $f: I\overrightarrow{I}$ be a function (I is set of integers) such that $f(0) = 1, f(f(n)) = f(f(n+2)+2) = n$. then $f(3) = 0$ b. $f(2) = 0$ c. $f(3 = -2)$ d. f is many one function

A. $f(3) = 0$

B. $f(2) = 0$

C. $f(3) = -2$

D. f is many -one function

Answer: C

Multiple Correct Answers Type

1. If $f(x) = 3x^2 - x + 1$, then find $f(-1)$

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2. If $f(x) = x^2 - 2x + 1$, then find $f(1)$

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3. If $f(x) = x^2 - 3x + 1$, then find $f\left(\dfrac{1}{2}\right)$

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4. The function 'g' defined by $g(x) = \sin\left(\sin^{-1}\{\sqrt{x}\} + \cos\left(\sin^{-1}\{\sqrt{x}\}\right) - 1\right)$ where {x} denotes the functional part function is

A. an even function

B. a periodic function

C. an odd function

D. neither even nor odd

Answer: A::B

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5. Let f be a differential function such that $f(x) = f(2 - x)$ and $g(x) = f(1 + x)$ then (1) g(x) is an odd function (2) g(x) is an even function (3) graph of f(x) is symmetrical about the line x= 1 (4) $f'(1) = 0$

A. g(x) is an odd function

B. g(x) is an even function

C. graph of $f(x)$ is symmetrical about the line x = 1

D. $f'(1) = 0$

Answer: B::C::D

6.   If   a   differentiable   function   satisfies

$(x - y)f(x + y) - (x + y)f(x - y) = 2(x^2y - y^2) \, \forall x, y \in R$ and $f(1) =$

then:

A. f(x) must be polynomial function

B. f(3) = 12

C. f(0) = 0

D. f(x) may not be differentiable

Answer: A::B::C

7. about to only mathematics

A. f(0) = 0

B. f(0) cannot be determined

C. k = 2

D. k cannot be determined

Answer: A::C

8. Suppose that $f(x)f(f(x)) = 1$ and $f(1000) = 999$ then which of the following is true

A. $f(500) = \dfrac{1}{500}$

B. $f(199) = \dfrac{1}{199}$

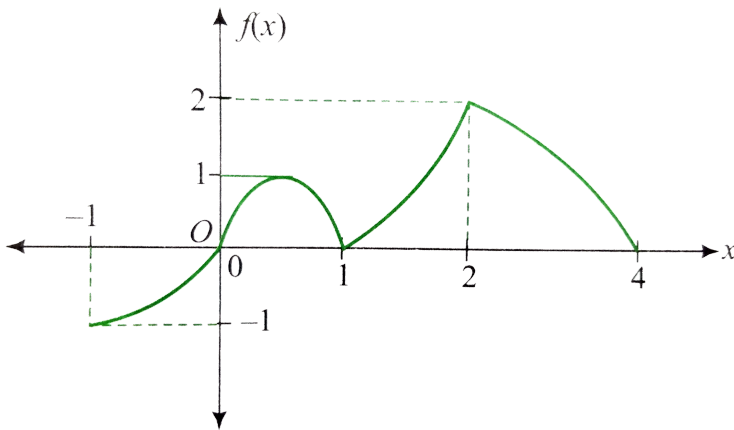C. $f(x) = \dfrac{1}{x} \; \forall x \in R - \{0\}$

D. $f(1999) = \dfrac{1}{1999}$

Answer: A::B

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9. If graph of a function $f(x)$ which is defined in [-1, 4] is shown in the following figure then identify the correct statement(s).

A. domain of $f(|x| - 1)$ is $[-5, 5]$

B. range of $f(|x| + 1)$ is $[0, 2]$

C. range of $f(- |x|)$ is $[- 1, 0]$

D. domain of $f[- 3, 3]$

Answer: A::B::C

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Comprehension Type

1. Let $f(x) = x^2 - 2x - 1 \forall x \in R.$ Let $f: (- \infty, a] \to [b, \infty),$ where a is the largest real number for which f(x) is bijective.

If $f: R \to R,$ then range of values of k for which equation $f(|x|) = k$ has 4 distinct real roots is

  A. $- 9/4$

  B. $- 5/4$

  C. $- 2$

  D. $- 1$

Answer: C

2. Let $f(x) = x^2 - 2x - 1 \forall x \in R$. Let $f: (-\infty, a] \to [b, \infty)$, where a

is the largest real number for which f(x) is bijective.

If $f: R \to R$, then range of values of k for which equation $f(|x|) = k$ has

4 distinct real roots is

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

    B. $1 - \sqrt{x + 3}$

    C. $1 - \sqrt{x + 2}$

    D. $1 + \sqrt{x + 3}$

Answer: A

3. Let $f(x) = x^2 - 2x - 1 \forall \xi n R$ Let $f: (-\infty, a] \to [b, \infty)$, where a is the largest real number for which f(x) is bijective. If $f: R \to R$, $g(x) = f(x) + 3x - 1$, then the least value of function $y = g(|x|)$ is

A. $(-2, -1)$

B. $(-2, 0)$

C. $(-1, 0)$

D. $(0, 1)$

Answer: A

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4. Consider a differentiable $f: R \to R$ for which $f(1) = 2$ and $f(x + y) = 2^x f(y) + 4^y f(x) \forall x, y \in R$. The value of f(2) is

A. 16

B. 12

C. 20

D. none of these

Answer: B

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5. Consider a differentiable $f: R \to R$ for which $f(1) = 2$ and $f(x + y) = 2^x f(y) + 4^y f(x) \, \forall x, y \in R$. The minimum value of $f(x)$ is

A. 1

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

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

D. none of these

Answer: C

6. Let $f(x)$ be real valued and differentiable function on R such that $f(x+y) = \dfrac{f(x)+f(y)}{1-f(x)f(y)}$ $f(0)$ is equals a. b. c. d. none of these

A. 1

B. 0

C. -1

D. none of these

Answer: B

7. Let $f(x)$ be real valued and differentiable function on R such that $f(x+y) = \dfrac{f(x)+f(y)}{1-f(x)f(y)}$ $f(0)$ is equals a. b. c. d. none of these

A. odd function

B. even function

C. odd and even function simultaneously

D. neither even nor odd

Answer: A

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