MATHS

BOOKS - DHANPAT RAI & CO MATHS (HINGLISH)

FUNCTIONS

Illustration

1. Let $A = \{1, 2, 3\}$, $B = \{2, 3, 4)$ be two sets, which one of the following subsets of $A \times B$ defines a funciton from A to B?

A. $f_1 = \{(1, 2), (2, 3), (3, 4)\}$

B. $f_2 = \{(1, 2), (1, 3), (2, 3), (3, 4)\}$

C. $f_3 = \{(1, 3), (2, 4), \}$

D. $f_4 = \{(1, 4), (2, 4), (3, 4), (2, 3)\}$

Answer: A

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2. If $A = \{1, 2, 3, 4\}$, then which of the following are functions from A to itself?

A. $f_1 = \{(x, y), : y = x + 1\}$

B. $f_2 = \{(x, y), x + y > 4\}$

C. $f_3 = \{(x, y) : y < x\}$

D. $f_4 = \{(x, y) : x + y = 5\}$

Answer: D

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3. If a function $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ is described by $g(x) = \alpha x + \beta$, then the values of $\alpha$and β are

A. $(2, -1)$

B. $(2, 1)$

C. $(1, 2)$

D. $(1, -2)$

Answer: A

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4. Given $A = \left\{x : \frac{\pi}{6} \leq x \leq \frac{\pi}{3}\right\}$ and $f(x) = \cos x - x(1 + x)$. Find $f(A)$.

A. $[\pi/6, \pi/3]$

B. $[-\pi/3, \pi - 6]$

C. $\left[\frac{1}{2} - \frac{\pi}{3}\left(1 + \frac{\pi}{3}\right), \frac{\sqrt{3}}{2} - \frac{\pi}{6}\left(1 + \frac{\pi}{6}\right)\right]$

D. $\left[\frac{1}{2} + \frac{\pi}{3}\left(1 - \frac{\pi}{3}\right), \frac{\sqrt{3}}{2} + \frac{\pi}{6}\left(1 - \frac{\pi}{6}\right)\right]$

Answer: C

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5. If $f(x) = \cos(\log x)$, then $f(x)f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right] =$

A. 0

B. $\frac{1}{2}f(x)f(y)$

C. $f(x+y)$

D. none of these

Answer: A

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6. Let a, b, c be rational numbers and $f: Z \to Z$ be a function given by $f(x) = ax^2 + bx + c$. Then, $a + b$ is

A. a negative integer

B. an integer

C. non-integral rational number

D. none of these

Answer: B

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7. If $f: Z \to Z$ be given by $f(x) = x^2 + ax + b$, Then,

A. $a \in Z$ and $b \in Q - Z$

B. $a, b, \in Z$

C. $b \in Z$ and $a \in Q - Z$

D. $a, b \in Q - Z$

Answer: B

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8. Find the image of interval $[-1, 3]$ under the mapping specified by the function $f(x) = 4x^3 - 12x$.

A. $[8, 72]$

B. $[-8, 72]$

C. $[0, 8]$

D. $[8, -72]$

Answer: B

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9. If $f(x) = ax^2 + bx + c$ and $g(x) = px^2 + qx$ with $g(1) = f(1)$, $g(2) - f(2) = 1, g(3) - f(3) = 4$ then $g(4) - f(4)$ is

A. 0

B. 5

C. 6

D. none of these

Answer: D

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10. For which Domain, the functions $f(x) = 2x^2 - 1$ and $g(x) = 1 - 3x$ are equal to

A. $[2, -1/2]$

B. $\{-2, 1/2\}$

C. $[1, 2]$

D. $[-2, -1/2]$

Answer: B

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11. If function f and g given by

$f(x) = \log(x-1) - \log(x-2)$ and $g(x) = \log\left(\frac{x-1}{x-2}\right)$ are equal

then x lies in the interval.

A. [1,2]

B. $[2, \infty]$

C. $[2, \infty]$

D. $[-\infty, \infty]$

Answer: C

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12. If $A = \{1, 2, 3\}$, $B = \{x, y\}$, then the number of functions that can be defined from A into B is 12 b. 8 c. 6 d. 3

A. 12

B. 8

C. 6

D. 3

Answer: B

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13. Let A be a set containing 10 distinct elements, then the total number of distinct functions from A to A is

A. $10!$

B. 10^{10}

C. 2^{10}

D. $2^{10} - 1$

Answer: B

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14. If $P = (a, b, c)$ and $Q = (1, 2)$, then the total number of relations P to Q are not functions is

A. 56

B. 8

C. 9

D. 55

Answer: A

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15. A mapping $f: X \to Y$ is one-one, if

A. $f(x_1) \neq f(x_2)$ for all $x_1, x_2 \in X$

B. $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$ for all $x_1, x_2 \in X$

C. $x_1 = x_2 \Rightarrow f(x_1) = f(x_2)$ for all $x_1, x_2 \in X$

D. none of these

Answer: B

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16. Which of the following functions is one-one?

A. $fR \to R$ is given by $f(x) = 2x^1 + 1$For all $x \in R$

B. $g: Z \to Z$ given by $g(x) = x^4$For all $x \in Z$

C. $h: R \to R$ given $\mathrm{h}(x) = x^3 + 4$For all $x \in R$

D. $\phi: C \to C$ given by $\phi(z) = z^3 + 4$For all $z \in C$

Answer: C

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17. Which one of the following functions is one-one?

A. $f: R \to R$ given by $f(x)|x - 1|$for all $x \in R$

B. $g: [-\pi/2, \pi/2] \in R$ is given by:

$g(x) = |\sin x| \text{for all} \quad x \in [-\pi/2, \pi/2]$

C. $h: [-\pi/2, \pi/2] \in R$ is given by

$h = (x) = \sin x \quad \text{for all} \quad x \in [-\pi/2, \pi/2]$

D. $\phi: R \to R \text{given by} f(x) = x^2 - 4 \text{for all x} \quad \in R$

Answer: C

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18. Which one of the following functions is not one-one?

A. $f: (-1, \infty) \to R \quad \text{given by} \quad f(x) = x^2 + 2x$

B. $g: (1, \infty) \to R \quad \text{given by} \quad g(x) = e^{x^3 - 3x + 2}$

C. $h: R \to R given by h(x) = 2^{x^x - 1}$

D. $\phi, (-\infty, 0) \to R \text{given by} \phi(x) = \dfrac{x^2}{x^2 + 1}$

Answer: C

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19. If $f: R \to R$ is given by

$f(x) = x^3 + (a+2)x^2 + 3ax + 5a$

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20. Set A has three elements and set B has four elements. The number of injections that can be defined from A to B is

A. 144

B. 12

C. 24

D. 64

Answer: C

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21. Which of the following functions is a surjection?

A. $f: R \to R$ given by $f(x) = x^3 + 2$for all x $\in R$

B. $g: R \to R$ given by $g(x) = x^2 + 2$for all x $\in R$

C. $h: Z \to Z$ given by $h(x) = 3x + 2$for all x $\in Z$

D. $\phi: R \to R$ given by $f(x) = x^2 - 3x + 2$for all x $\in R$

Answer: A

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22. Let $E = (1, 2, 3, 4)$ and $F - (1, 2)$. Then the number of onto functions from E to F is:

A. 14

B. 16

C. 12

D. 8

Answer: A

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23. Let $A = \{1, 2, \ldots, n\}$ and $B = \{a, b\}$. Then number of subjections from A into B is nP2 (b) $2^n - 2$ (c) $2^n - 1$ (d) nC2

A. $\hat{} (n)P_2$

B. $2^n - 2$

C. $2^n - 1$

D. none of these

Answer: B

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24. If $X = \{1, 2, 3, 4\}$, then one-one onto mappings $f: X \to X$ such that $f(1) = 1$, $f(2) \neq 2 f(4) \neq 4$ are given by

A. {(1,1),(2,3),(3,4),(4,2)}

B. {(1,1),(2,4),(3,3),(4,2)}

C. {(1,1),(2,4),(3,2),(4,3)}

D. none of these

Answer: D

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25. The function of $f: R \to R$ defined by

$f(x) = 2^x + x^{|x|}$, is

A. one-one and onto

B. many-one and onto

C. one-one and into

D. many-one and into

Answer: C

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26. The total number of onto functions from the set {1,2,3,4) to the set (3,4,7) is

A. 18

B. 36

C. 64

D. none of these

Answer: B

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27. $f: R \to R$ given by $f(x) = x + \sqrt{x^2}$,is

A. injective

B. surjective

C. bijective

D. none of these

Answer: D

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28. The set of parameter 'a' for which the functions $f: R \to R$ defined by $f(x) = ax + \sin x$ is bijective, is

A. [-1,1]

B. R-[-1,1]

C. R-[-1,1]

D. [-1,1]

Answer: C

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29. Let f be an injective map. with domain (x, y, z and range (1, 2, 3), such that exactly one following statements is correct and the remaining are false : $f(x) = 1, f(y) \neq 1, f(z) \neq 2$ The value of $f^{-1})(1)$ is

A. x

B. y

C. z

D. none of these

Answer: B

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30. If $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right)$ and $g\left(\frac{5}{4}\right) = 1,$ then $(gof)(x)$ is _____

A. a polynomial of first degree in sin x and cos x

B. a constant function

C. a polynomial of second degree in sin x and cos x

D. none of these

Answer: B

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31. If g(x) = $x^2 + x - 2$ and $\frac{1}{2}g(f(x)) = 2x^2 - 5x + 2$, then $f(x)$ is

A. $2x - 3$

B. $2x + 3$

C. $2x^2 + 3x + 1$

D. $2x^2 - 3x - 1$

Answer: A

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32. If $f(x) = \sin^2 x$ and the composite functions $g\{f(x)\} = |\sin x|$, then the function $g(x) =$

A. $\sqrt{x-1}$

B. $\sqrt{x}$

C. $\sqrt{x+1}$

D. $-\sqrt{x}$

Answer: B

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33. If $f: R \to R$ is given by $f(x) = 3x - 5$ then $f^{-1}(x)$

A. is given by $\frac{1}{3x-5}$

B. is given by $\frac{x+5}{3}$

C. does not exist because f is not one-one

D. does not exist because is not onto

Answer: B

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34. Let $f:[4,\infty)\to[4,\infty)$ be defined by $f(x)=5^{x(x-4)}$.Then $f^{-1}(x)$ is

A. $2-\sqrt{4-\log sx}$

B. $2+\sqrt{4+\log sx}$

C. $\left(\frac{1}{5}\right)^{x^{x+4}}$

D. not defined

Answer: B

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35. $f(x)=\frac{1-x}{1+x}, x=-1$ then $f^{-1}(x)$ relation to

A. f(x)

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

C. $-f(x)$

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

Answer: A

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Section I Solved Mcqs

1. Let $A = \{x \in R: -1 \leq x \leq 1\} = B$ and $c = \{x \in R: x \geq 0\}$ and let

$S = \{(x, y) \in A \times B: x^2 + y^2 = 1\}$ and $S_0 = \{(x, y) \in A \times C: x^2 + y^2$

The

A. S defines a function from A to B

B. S_0 defines a function from A to C

C. S_0 defines a function from A to b

D. S defines a function from A to c

Answer: B

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2. $f: R \to R$given by$f(x) = 2x + |\cos x|,$ is

A. one-one and into

B. one-one and onto

C. many-one and into

D. many-one and onto

Answer: B

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3. The function $f: N \to N$ given by $f(n) = n - (-1)^n$ is

A. one-one and into

B. one-one and onto

C. many-one and into

D. many-one and onto

Answer: A

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4. If $f: A \to B$ given by $3^{f(x)} + 2^{-x} = 4$ is a bijection, then

A. $A = (x \in R: -1 < x < \infty), B = (x \in R: 2 < x < 4)$

B. $A = (x \in R: -3 < x < \infty), B = (x \in R: 0 < x < 4)$

C. $A = (x \in R: -2 < x < \infty), B = (x \in R: 0 < x < 4)$

D. None of these

Answer: D

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5. Let $A = \{x : 0 \leq x < \pi/2\}$ and $f : R \to A$ be an onto function given by $f(x) = \tan^{-1}\left(x^2 + x + \lambda\right)$, where λ is a constant. Then,

A. $\lambda > 0$

B. $\lambda \geq 1/4$

C. $\lambda < 1/4$

D. $0 \leq \lambda \leq 1$

Answer: B

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6. Let $f(x) = x^2$ and $g(x) = 2^x$. Then the solution set of the equation $fog(x) = gof(x)$ is R (b) {0} (c) {0, 2} (d) none of these

A. R

B. {0}

C. {0,2}

D. None of these

Answer: C

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7. $f(x) = \log_{x^2} 25$ and $g(x) = \log_x 5$. Then f(x)=g(x) holds for x belonging to

A. R

B. $\{x : 0 < x < \infty, x \neq 1\}$

C. ϕ

D. None of these

Answer: B

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8. If $g(f(x)) = |\sin x|$ and $f(g(x)) = \left(\sin\left(\sqrt{x}\right)\right)^2$ then

A. $f(x) = \sin^2 x, g(x) = \sqrt{x}$

B. $f(x) = \sin x, g(x) = |x|$

C. $f(x) = x^2, g(x) = \sin\sqrt{x}$

D. f and g cannot be determined

Answer: A

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9. The inverse of the function $f: R \to \{x \in R: x < 1\}$ given by $f(x) = \dfrac{e^x - e^{-x}}{e^x + e^{-x}}$, is

A. $\dfrac{1}{2}\log\dfrac{1+x}{1-x}$

B. $\dfrac{1}{2}\log\dfrac{2+x}{2-x}$

C. $\dfrac{1}{2}\log\dfrac{1-x}{1+x}$

D. None of these

Answer: A

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10. Let $A = (x \in R : x \geq 1)$. The inverse of the function of $f : A \to A$ given by $f(x) = 2^{x(x-1)}$. Is

A. $\left(\frac{1}{2}\right)^{x(x-1)}$

B. $\frac{1}{2}\left\{1 + \sqrt{1 + 4\log_2 x}\right\}$

C. $\frac{1}{2}\left\{1 - \sqrt{1 + 4\log_2 x}\right\}$

D. None of these

Answer: B

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11. Let $f(x) = \frac{1}{1-x}$. Then $(\text{fp}\,(\text{fof}))\,(\text{x})$

A. x for all ξnR

B. x for all $x \in R - [1]$

C. x for all $ximnR - [0, 1]$

D. None of these

Answer: C

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12. Let $A = \left\{x \in R : x \geq \frac{1}{2}\right\}$ and $B = \left\{x \in R : x \geq \frac{3}{4}\right\}$. If $f : A \to B$ is defined as $f(x) = x^2 - x = 1,$ then the solution set of the equation $f(x) = f^{-1}(x)$ is

A. {1}

B. {2}

C. {1//2}

D. None of these

Answer: A

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13. Let the function $f: R-(-b) \to r-(-1)$ is defined by $\frac{x+a}{x+b} = \frac{y+a}{y+b}$, then

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. None of these

Answer: C

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14. if $f: [1, \infty) \to [2, \infty)$ is given by $f(x) = x + \frac{1}{x}$ then $f^{-1}(x)$ equals to : a) $\frac{x+\sqrt{x^2-4}}{2}$ b) $\frac{x}{1+x^2}$ c) $\frac{x-\sqrt{x^2-4}}{2}$ d) $1+\sqrt{x^2-4}$

A. $\frac{x+\sqrt{x^2-4}}{2}$

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

C. $\frac{x-\sqrt{x^2-4}}{2}$

D. $1+\sqrt{x^2-4}$

Answer: A

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15. Let $g(x)=1=x-[x]$ and $f(x)=\{-1, x<0, 0, x=0$ and $1, x>0,$ then for all x, $f(g(x))$ is equal to (i) x (ii) 1 (iii) f(x) (iv) g(x)

A. x

B. 1

C. f(x)

D. g(x)

Answer: B

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16. Let $f(x) = \frac{\alpha x}{(x+1)}, x \neq -1$. The for what value of α is $f(f(x)) = x$? $\sqrt{2}$ (b) $-\sqrt{2}$ (c) 1 (d) -1

A. $\sqrt{2}$

B. $-\sqrt{2}$

C. 1

D. -1

Answer: D

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17. Let the funciton $f: R \to R$ be defined by $f(x) = 2x + \sin x$. Then, f is

A. one-to-one and into

B. one-to-one but not onto

C. onto but not one-to-one

D. neither one-to-one nor onto

Answer: A

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18. Suppose $f(x) = (x+1)^2 f$ or $x \geq -1$. If $g(x)$ is the function whose graph is the reflection of the graph of $f(x)$ with respect to the line $y = x$, then $g(x)$ equal.

A. $-\sqrt{x} - 1, x \geq 0$

B. $\frac{1}{(x+1)^2}, x > -1$

C. $\sqrt{x+1}, x \geq -1$

D. $\sqrt{x} - 1, x \geq 0$

Answer: D

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19. Let $f: R \to R$ be a function defined by $f(x) = \ | \ x]$ for all $x \in R$ and let $A = [0, 1),$ then $f^{-1}(A)$ equals

A. (-1,1)

B. (0,1)

C. (-1,0)

D. None of these

Answer: A

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20. The function $f: (-\infty, -1)\overrightarrow{0, e^5}$ defined by $f(x) = e^x \ \hat{} \ (3 - 3x + 2)$ is many one and onto many one and into one-

one and onto one-one and into

A. one-one and into

B. one-one and into

C. many-one and into

D. many-one and onto

Answer: B

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21. If $f: R \to R, g: R$ and $h: R \to R$ be three functions are given by $f(x) = x^2 - 1, g(x) = \sqrt{x^2 + 1}$ and $h(x) = \begin{cases} 0 & x \leq 0 \\ x & x > 0 \end{cases}$

Then the composite functions (ho fog) (x)) is given by

A. $\begin{cases} -x^2 & x < 0 \\ 0 & x = 0 \\ x^2 & x > 0 \end{cases}$

B. $\begin{cases} x^2 & x \neq 0 \\ 0 & x = 0 \end{cases}$

C. $\begin{cases} x^2 & x > 0 \\ 0 & x \leq 0 \end{cases}$

D. None of these

Answer: B

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22. The distinct linear functions which map [-1,1] onto [0,2] are

A. $f(x) = x + 1, g(x) = -x + 1$

B. $f(x) = x - 1, g(x) = x + 1$

C. $f(x) = -x - 1, g(x) = x + 1$

D. None of these

Answer: A

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23. The values of a and b for which the map $f: R \to R$, given by f(x)=ax+b $(a, b \in R)$ is a bijection with fof as indentity function, are

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

B. $(a = 1, b = 0)$ or , $(a = -1, b \in R)$

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

D. $a = \pm 1, b = 0$

Answer: B

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24. The value of parameter α, for which the function $f(x) = 1 + \alpha x, \alpha \neq 0$ is the inverse of itself

A. -2

B. -1

C. 1

D. 2

Answer: B

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25. Let $f:(2,\infty)\to X$ be defined by f(x)=$4x-x^2$. Then f is invertible, if X=

A. $[2,\infty]$

B. $(-\infty,2]$

C. $(-\infty,4]$

D. $[4,\infty)$

Answer: C

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26. If $f: R \to S$ defined by $f(x) = \sin x - \sqrt{3}\cos x + 1$ is onto , then the interval of S is :

A. [0,1]

B. [-1,1]

C. [0,3]

D. [-1,3]

Answer: D

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27. If $f(x) = \begin{cases} |x| & x \leq 1 \\ 2 - x & x > 1 \end{cases}$, then fof (x) is equal to

A. $f(x) = \begin{cases} 2 - x & x < -1 \\ |x| & -1 \leq x \leq 1 \\ |2 - x| & x > 1 \end{cases}$

B. $f(x) = \begin{cases} |x| & x < -1 \\ 2 - |x| & -1 \leq x \leq 1 \\ |2 - x| & x > 1 \end{cases}$

C. $f(x) = \begin{cases} |2-x| & x < -1 \\ |x| & -1 \leq x \leq 1 \\ 2-|x| & x > 1 \end{cases}$

D. None of these

Answer: A

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28. Let $A = \{x - 1 \leq x \leq 1\}$ and $f: A \to A$ such that $f(x) = x|x|$ then f is:

A. injective but not surjective

B. surjective but not injective

C. bijective

D. None of these

Answer: C

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29. If $f: R \overrightarrow{-1,1}$ is defined by $f(x) = -\frac{x|x|}{1+x^2}, then f^{-1}(x)$ equals $\sqrt{\frac{|x|}{1-|x|}}$ (b) $-sgn(x)\sqrt{\frac{|x|}{1-|x|}}$ $-\sqrt{\frac{x}{1-x}}$ (d) none of these

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

B. $-\text{sign}(x)\sqrt{\frac{|x|}{1-|x|}}$

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

D. None of these

Answer: B

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30. let $f: R \to R$ be given by $f(x) = [x]^2 + [x+1] - 3$, where $[x]$ denotes the greatest integer less than or equal to x. Then, $f(x)$ is

A. many-one and onto

B. many-one and into

C. one-one and into

D. one-one and onto

Answer: B

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31. Let M be the set of all 2×2 matrices with entries from the set R of real numbers. Then, the function $f: M \to R$ defined by $f(A) - |A|$ for every $A \in M,$ is

A. one-one and into

B. neither one-one nor onto

C. one-one but-not onto

D. onto but not one-one

Answer: D

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32. The function $f: [0, \infty] \to R$ given by f(x)=(x)/(x+1)` is

A. one-one and into

B. one-one but not onto

C. onto but not one-one

D. neither one-one nor onto

Answer: B

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33. Two functions $f: R \to R$ and $g: R \to R$ are defined as follows:

$$f(x) = \begin{cases} 0 & x \in Q \\ 1 & x \neq Q \end{cases}, g(x) = \begin{cases} -1 & x \in Q \\ 0 & x \in Q \end{cases}$$

Then, fof (e)+fog(π)

A. -1

B. 0

C. 1

D. 2

Answer: A

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34. The range of the function $f(x) = 7 - xp_{x-3}$, is

A. {1,2,3,4,5}

B. {1,2,3,4,5,6}

C. {1,2,3,4}

D. {1,2,3}

Answer: D

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35. A function f from the set of natural number to integers defined by

$$f(n) = \begin{cases} \frac{n-1}{2} & \text{when n is odd} \\ -\frac{n}{2} & \text{when n is even} \end{cases}$$

A. neither one-one nor onto

B. one-one but not onto

C. one but not one-one

D. one-one and onto both

Answer: D

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36. Let $f: (-1, 1) \vec{B}$ be a function defined by $f(x) = \frac{\tan^{-1}(2x)}{1-x^2}$. Then f is both one-one and onto when B is the interval. $\left[0, \frac{\pi}{2}\right)$ (b) $\left(0, \frac{\pi}{2}\right)$ $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (d) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

A. $(-\pi/2, \pi/2)$

B. $[-\pi/2, \pi/2]$

C. $[0, \pi/2]$

D. $(0, \pi/2)$

Answer: A

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37. Let $f: N\overrightarrow{Y}$ be a function defined as $f(x) = 4x + 3$, where $Y = \{y \in N : y = 4x + 3 \text{ for some } x \in N\}$. Show that f is invertible and its inverse is (1) $g(y) = \frac{3y+4}{3}$ (2) $g(y) = 4 + \frac{y+3}{4}$ (3) $g(y) = \frac{y+3}{4}$ (4) $g(y) = \frac{y-3}{4}$

A. $g(y) = \frac{y+3}{4}$

B. $g(y) = \frac{y-3}{4}$

C. $g(y) = \frac{3y+4}{3}$

D. $g(y) = 4 + \frac{y+3}{4}$

Answer: B

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38. 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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39. If X and Y are two non-empty sets where $f: X \to Y$,is function is defined such that $f(c) = \{f(x): x \in C\}$ for $C \subseteq X$ and $f^{-1}(D) = \{x: f(x) \in D\}$ for $D \subseteq Y$,for any $A \subseteq Y$ and $B \subseteq Y$, then

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

B. $f^{-1}(f(A)) = A$ only if f $(X) = Y$

C. $f\left(f^{-1}(B)\right) = B$ only if B $\subseteq f(X)$

D. $f\left(f^{-1}(B)\right) = B$

Answer: C

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40. For real x, let $f(x) = x^3 + 5x + 1$, then (1) f is oneone but not onto R (2) f is onto R but not oneone (3) f is oneone and onto R (4) f is neither oneone nor onto R

A. f is one-one but not onto

B. f is onto but not one-one

C. f is one-one and onto R

D. is niether one-one nor onto R

Answer: C

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41. Let $f:(0,1)\to R$ be defined by $f(x)=\frac{b-x}{1-bx}$, where b is constant such that $0<b<1$ .then ,

A. f is not invertible on (0,1)

B. $f\neq f^{-1}on(0,1)$ and $f'(b)=\frac{1}{f'(0)}$

C. $f=f^{-1}on(0,1)$ and $f'(b)=\frac{1}{f'(0)}$

D. f^{-1} is differentiable on (0,1)

Answer: A

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42. The function $f:[0,3]\to[1,29]$, defined by $f(x)=2x^3-15x^2+36x+1$ is

A. one-one and onto

B. onto but not one-one

C. one-one but not onto

D. neither one-one nor onto

Answer: B

Watch Video Solution

43. For a real number x, let [x] denote the greatest integer less than or equal to x. Let f: R $\rightarrow$ R be defined as $f(x) = 2x + [x] + \sin x \cos x$ then f 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: C

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44. If $P(S)$ denotes the set of all subsets of a given set S, then the number of one-to-one functions from the set $S = \{1, 2, 3\}$ to the set $P(S)$ is

A. 8

B. 320

C. 336

D. 24

Answer: C

Watch Video Solution

45. $f:\{1,2,3,4\} \to \{1,4,9,16\}$ and $g:\{1,4.9,16) \to \left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right\}$ are two bijective functions such that $x_1 > x_2 \Rightarrow f(x_1) < f(x_2), g(x_1) > g(x_2)$ then $f^{-1}\left(g^{-1}\left(\frac{1}{2}\right)\right)$ is equal to

A. 1

B. 4

C. 16

D. 2

Answer: D

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46. In the above example $(gof)^{-1}\left(\frac{1}{4}\right)$ is equa to

A. 16

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

C. 4

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

Answer: C

View Text Solution

47. If a real polynomial of degree n satisfies the relation $f(x) = f(x)f''(x)$ for all $x \in R$ Then $fR \to R$

A. an onto function

B. an into function

C. always a one function

D. always a many one function.

Answer: A

Watch Video Solution

48. If the function, $f: [1, \infty] \to [1, \infty]$ is defined by $f(x) = 3^{x(x-1)}$, then $f^{-1}(x)$ is

A. $\left(\frac{1}{3}\right)^{x(x-1)}$

B. $\frac{1}{2}\left\{1 - \sqrt{1 + 4\log_3 x}\right\}$

C. $\frac{1}{2}\left\{1 + \sqrt{1 + 4\log_3 x}\right\}$

D. not defined

Answer: C

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49. The function $f: R \to \left[-\frac{1}{2}, \frac{1}{2}\right]$ defined as $f(x) = \frac{x}{1 + x^2}$ is

A. surejective but not injective

B. neither injective nor surjective

C. invertible

D. injective but not surjective

Answer: A

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Section Ii Assertion Reason Type

1. Statement-1: If A and B are two sets having 3 and 5 elements respectively, then the total number of functions that can be defined from A to B is 5^3.

Statement-2: A function from set A to set B relates elements of set A to elements of set B.

A. 1

B. 2

C. 3

D. 4

Answer: C

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2. Statement-1: If two sets X and Y contain 3 and 5 elements respectively, then $.^5 C_3 \times 3!$ one-one functions can be defined from X to Y.

Statement:2: A one-one function from X to Y relates different element of set X to different elements of set Y.

A. 1

B. 2

C. 3

D. 4

Answer: A

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3. Statement-1: Let A and B be two sets having m and n elements respectively such that $m < n$. Then,

Number of surjections from A to B $= \sum_{r=1}^{n} {}^{n}C_{r}(-1)^{n-r}r^{m}$

Statement-2: If $f: A \to B$ is a surjection, then every element in B has a pre-image in A.

A. 1

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

4. Statement-1: The function $f: R \to R$ defined by $f(x) = x^3 + 4x - 5$ is a bijection.

Statement-2: Every odd degree has at least one real root.

A. 1

B. 2

C. 3

D. 4

Answer: A

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5. Statement-1: If $f: R \to R$ and $g: R \to R$ be two functions such that $f(x) = x^2$ and $g(x) = x^3$, then fog (x)=gof (x).

Statement-2: The composition of functions is commulative.

A. 1

B. 2

C. 3

D. 4

Answer: C

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6. Let $f: A \to A$ and $g: A \to A$ be two functions such that fog(x)=gof (x)=x for all $x \in A$

Statement-1:

$\{x \in A: f(x) = g(x)\} = \{x \in A: f(x) = x\} = \{x \in A: g(x) = x\}$

Statement-2: $f: A \to A$ is bijection.

A. 1

B. 2

C. 3

D. 4

Answer: A

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7. Let $f: [-1, \infty] \in [-1, \infty]$ be a function given $f(x) = (x+1)^2 - 1, x \geq -1$

Statement-1: The set $\left[x : f(x) = f^{-1}(x)\right] = \{0, 1\}$

Statement-2: f is a bijection.

A. 1

B. 2

C. 3

D. 4

Answer: A

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8. Statement-1: The funciton $f : N \to N$ given by $f(n) = n - (-1)^n$ for all $n \in N$ is invertible.

Statement-2: The successor and prodecessor of an even natural number are odd natural numbers and that of an odd natural number are even natural number.

A. 1

B. 2

C. 3

D. 4

Answer: A

View Text Solution

9. The image of [-1,3] under f is not the interval $[f(-1), f(3)]$

Statement-2: f is not an injective map.

A. 1

B. 2

C. 3

D. 4

Answer: A

View Text Solution

10. Let f be a function defined by

$f(x) = (x-1)^2 + x, (x \geq 1).$

Statement-1: The set $\left[x : f(x) = f^{-1}(x)\right] = \{1, 2\}$

Statement-2: f is a bijectioon and $f^{-1}(x) = 1 + \sqrt{x-1}, x \geq 1$

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

Exercise

1. If $f(x) = (a - x^n)^{\frac{1}{n}}$ then $fof(x)$ is (A) x (B) a-x (C) x^2 (D) $-\frac{1}{x^n}$

A. a

B. x

C. x^n

D. a^n

Answer: B

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2. Let f(x) be defined on [-2,2] and is given by

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

and g(x) $= f(|x|) + |f(x)|$. Then g(x) is equal to

A. $\begin{cases} -x & -2 \leq x < 0 \\ 0 & 0 \leq x < 1 \\ x-1 & 1 \leq x \leq 2 \end{cases}$

B. $\begin{cases} -x & -2 \leq x < 0 \\ 0 & 0 \leq x < 1 \\ 2(x-1) & 1 \leq x \leq 2 \end{cases}$

C. $\begin{cases} -x & -2 \leq x < 0 \\ x-1 & 0 \leq x \leq 2 \end{cases}$

D. none of these

Answer: B

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3. Which of the following functions from Z to itself are bijections? a

A. $f(x) = x^3$

B. $f(x) = x + 2$

C. $f(x) = 2x + 1$

D. $f(x) = x^2 + x$

Answer: B

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4. Which of the following functions from A=$\{x : -1 \leq x \leq 1\}$ to itself are bijections.?

A. $f(x) = \frac{|x|}{2}$

B. $g(x) = \sin\left(\frac{\pi x}{2}\right)$

C. $h(x) = |x|$

D. $k(x) = x^2$

Answer: B

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5. If $f: R \to R$ be a mapping defined by $f(x) = x^3 + 5$, then f^{-1}(x) is equal to

A. $(x + 5)^{1/3}$

B. $(x - 5)^{1/3}$

C. $(5 - x)^{1/3}$

D. $5 - x$

Answer: B

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6. Let $f: A \to B$ and $g: B \to C$ be bijection, then $(fog)^{-1}$=

A. $f^{-1}og^{-1}$

B. fog

C. $g^{-1}of^{-1}$

D. gof

Answer: C

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7. Let $f: R \to R, g: R \to R$ be two functions given by $f(x) = 2x - 3, g(x) = x^3 + 5$. Then $(fog)^{-1}$ is equal to

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

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

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

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

Answer: D

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8. Let $f: R \to R$ be a function defined b f(x)=cos(5x+2). Then,f is

A. injective

B. surjective

C. bijective

D. none of these

Answer: D

Watch Video Solution

9. Let $f: N \to N$ be defined by $f(x) = x^2 + x + 1, x \in N$. Then is f is

A. one-one onto

B. many one onto

C. one-one but not onto

D. none of these

Answer: C

Watch Video Solution

10. Let $A = \{-1 \leq x \leq 1\}$ and $f: A \to A$ such that $f(x) = x|x|$ then f is:

A. a bijection

B. injective but not surjective

C. surjective but not injective

D. neither injective nor surjective

Answer: A

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11. If $f(x) = \frac{3x+2}{5x-3}$, then

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

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

C. $(fof)(x) = -x$

D. $f^{-1}(x) = -\frac{1}{19}f(x)$

Answer: A

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12. If $f(x) = 2^x$, then $f(0), f(1), f(2)...$ are in

A. AP

B. GP

C. HP

D. arbitrary

Answer: B

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13. If the function $f: R \overrightarrow{A}$ given by $f(x) = \frac{x^2}{x^2+1}$ is surjection, then find A.

A. R

B. [0,1]

C. [0,1]

D. [0,1]

Answer: D

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14. Which of the following functions is the inverse of itself? $f(x) = \frac{1-x}{1+x}$ (b) $f(x) = 5^{\log x}$ $f(x) = 2^{x(x-1)}$ (d) None of these

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

B. $g(x) = 5^{\log x}$

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

D. none of these

Answer: A

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15. If $f(x) = \frac{x-1}{x+1}$ then $f(2x)$ is equal to

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

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

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

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

Answer: B

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16. If $f(x)=\log\left(\frac{1+x}{1-x}\right) and g(x)=\left(\frac{3x+x^3}{1+3x^2}\right)$, then $f(g(x))$ is equal to $f(3x)$ (b) $\{f(x)\}^3$ (c) $3f(x)$ (d) $-f(x)$

A. $-f(x)$

B. $3f(x)$

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

D. none of these

Answer: B

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17. If $f(x) = a^x$, which of the following equalities do not hold ? (i) $f(x+2) - 2f(x+1) + f(x) = (a-1)^2 f(x)$ (ii) $f(-x)f(x) - 1 = 0$ (iii) $f(x+y) = f(x)f(y)$ (iv) $f(x+3) - 2f(x+2) + f(x+1) = (a-2)^2 f(x+1)$

A. $f(x+2) - 2f(x+1) + f(x) = (a-1)^2 f(x)$

B. $f(-x)f(x) - 1 = 0$

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

D. $f(x+3) - 2(x+2) + f(x+1) = (a-2)^2 f(x+1)$

Answer: D

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18. The interval in which the function $y = f(x) = \dfrac{x-1}{x^2 - 3x + 3}$ transforms the real line is

A. $(0, \infty)$

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

C. $[0, 1]$

D. $[-1/3, 1]$

Answer: D

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

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

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

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

D. none of these

Answer: D

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20. If f(x)=ax+b and g(x)=cx+d, then f(g(x))=g(f(x)) is equivalent to

A. $f(a) = g(c)$

B. $f(b) = g(b)$

C. $f(d) = g(b)$

D. $f(c) = g(a)$

Answer: C

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21. Which of the following functions is not an are not an insjective map(s) ?

A. $f(x) = |x + 1|, x \in [-1, \infty]$

B. $g(x) = x + \frac{1}{x}, x \in (0, \infty)$

C. $h(x) = x^2 + 4x - 5, x \in (0, \infty)$

D. $k(x) = e^{-x}, x \in [0, \infty]$

Answer: B

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22. If $f(x)$ is defined on $[0, 1]$ by the rule $f(x) = \{x,$ if x is rational , $1 - x,$ if x is rational ' then for all $x \in [0, 1]$,$f(f(x))$ is

A. constant

B. 1+x

C. x

D. none of these

Answer: C

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23. Let f(x)=x amd g(x)=|x| for all $x \in R$. Then the function $\phi(x)$satisfying$\{\phi(x) - f(x)\}^2 + \{\phi(x) - g(x)\}^2$ =0 is

A. $\phi(x) = x, x \in [0, \infty]$

B. $\phi(x) = x, x \in R$

C. $\phi(x) = -x, x \in (-\infty, 0)$

D. $\phi(x) = -x + |x|, x \in R$

Answer: A

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24. Let $f(x) = \frac{ax + b}{cx + d}$. 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. $a = b = c = d = 1$

D. $a = b = 1$

Answer: A

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25. If $f(x) = \left(ax^2 + b\right)^3$, then the function g satisfying f(g(x))=g(f(x)) is given by

A. $g(x) = \left(\frac{b - x^{1/3}}{a}\right)^{1/2}$

B. $g(x) = \frac{1}{(ax^2 + b)^3}$

C. $g(x) = \left(ax^2 + b\right)^{1/3}$

D. $g(x) = \left(\frac{x^{1/3} - b}{a}\right)^{1/2}$

Answer: D

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26. If a funciton $f:[2,\infty] \to B$ defined by $f(x) = x^2 - 4x + 5$ is a bijection, then B=

A. R

B. $[1,\infty]$

C. $[4,\infty]$

D. $[5,\infty]$

Answer: B

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27. The function $f:R \to R$ is defined by $f(x) = (x-1)(x-2)(x-3)$ is

A. one-one but not onto

B. onto but not one-one

C. both one and onto

D. neither one-one nor onto

Answer: B

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28. Let $A = \{x, y, z\} = B = \{u, v, w)$ and $f: A \to B$ be defined by f $(x) = u, f(y) = v, f(z) = w$. Then, f is

A. surjective but not injective

B. injective but not surjective

C. bijective

D. none of these

Answer: C

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29. If $f: R \to R$ be defined by $f(x) = x^2 + 1$, then find $f^{-1}(17)$ and $f^{-1}(-3)$.

A. $\phi, [4, -4]$

B. $[3-, 3], \phi$

C. $[4, -4], \phi$

D. $[4, -4], [2, -2]$

Answer: C

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30. The function $f: N\overrightarrow{N}$ (N is the set of natural numbers) defined by $f(n) = 2n + 3is$ (a) surjective only (b) injective only (c) bijective (d) none of these

A. surjective

B. injective

C. bijective

D. none of these

Answer: B

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31. The composite mapping fog of the maps $f: R \to R, f(x) = \sin x$ and $g: R \to R, g(x) = x^2$, is

A. $x^2 \sin x$

B. $(\sin x)^2$

C. $\sin x^2$

D. $\frac{\sin x}{x^2}$

Answer: C

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32. Let $f: R \to R$ be defined by f(x)=3x-4. Then, f^{-1}(x) is

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

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

C. $3x+4$

D. none of these

Answer: A

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33. $f: R \to R$ is a function defined by f(x)=$10x-7$, if $g=f^{-1}$ then g(x)=

A. $\frac{1}{10x-7}$

B. $\frac{1}{10x+7}$

C. $\frac{x+7}{10}$

D. $\frac{x-7}{10}$

Answer: C

Watch Video Solution

34. Let $A = \{x \in R : x \leq 1\}$ and $f : A \to A$ be defined as $f(x) = x(2 - x)$. Then , $f^{-1}(x)$ is

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

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

C. $\sqrt{1 - x}$

D. $1 \pm \sqrt{1 - x}$

Answer: B

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35. If $f(x) = x^n, n \in N$ and $gof(x) = ng(x)$ then g(x) can be

A. $n|x|$

B. $3x^{1/3}$

C. e^x

D. $\log|x|$

Answer: D

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36. If the function $f: R \to R$ be such that $f(x) = x - [x]$, where $[x]$ denotes the greatest integer less than or equal to x, then $f^{-1}(x)$ is

A. $\dfrac{1}{x - [x]}$

B. $[x] - x$

C. not defined

D. none of these

Answer: C

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37. $f: R \to R$ given by f(x)=5-3 sin x, is

A. one-one

B. onto

C. one-one and onto

D. none of these

Answer: D

Watch Video Solution

38. Let $f: A \to B$ be a function defined by $f(x)\sqrt{3}\sin x + \cos x + 4$. If f is invertible, then

A. $A = [-2\pi/3, \pi/3], B = [2, 6]$

B. $A = [\pi/6, 5\pi/6], B = [-2, 2]$

C. $A = [-\pi/2, \pi/2], B = [2, 6]$

D. $A = [-\pi/3, \pi/3], B = [2, 6]$

Answer: A

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39. Let $f: A \to B; g: B \to A$ be two functions such that $gof = I_A$. Then; f is an injection and g is a surjection.

A. f is an injection and g is a surjection

B. f is a surjection and g is an injection

C. f and g both are injections

D. f and g both are surjections

Answer: A

Watch Video Solution

40. Let $f: A \to B; g: B \to A$ be two functions such that $fog = I_B$. Then; f is a surjection and g is an injection.

A. f and g both are injections

B. f and both are surjections

C. f is and injection and g is a surjection

D. f is a injections and g is a surjection

Answer: D

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41. If $f: A\vec{B} and g: B\vec{C}$ are one-one functions, show that gof is one-one function.

A. f is onto

B. g is onto

C. f and g both are onto

D. none of these

Answer: B

Watch Video Solution

42. If functions $f: A \to B$ and $g: B \to A$ satisfy $gof = I_A$, then show that f is one-one and g is onto.

A. f is one-one

B. g is one-one

C. f and g both are one-one

D. none of these

Answer: A

Watch Video Solution

43. Let $f: A \to B$ and $g: B \to C$ be two functions. Then; if gof is onto then g is onto; if gof is one one then f is one-one and if gof is onto and g is one one then f is onto and if gof is one one and f is onto then g is one one.

A. f is one-one

B. g is one-one

C. f and g both are one-one

D. none of these

Answer: B

Watch Video Solution

44. If $f: A\vec{B} and g: B\vec{C}$ are one-one functions, show that gof is one-one function.

A. one-one

B. onto

C. one-one and onto

D. none of these

Answer: A

Watch Video Solution

45. Let [x] denote the greatest integer less than or equal to x. If $f(x) = \sin^{-1} x, g(x) = \left[x^2\right]$ and $h(x) = 2x, -\frac{1}{2} \leq x \leq \frac{1}{2}, then$

A. $fogoh(x) = \pi/2$

B. fogoh(x)=π

C. hofog=hogof

D. $hofog \neq fogof$

Answer: C

Watch Video Solution

46. If $f(x) = \sin^2 x, g(x) = \sqrt{x}$ and $h(x) = \cos^{-1} x, 0 \leq x \leq 1,$ then

A. hogof=fogoh

B. gofoh=fohog

C. fohog=hogof

D. none of these

Answer: D

Watch Video Solution

47. If $f(x) = \left(25 - x^4\right)^{1/4}$ for $0 < x < \sqrt{5}$, then $f\left(f\left(\frac{1}{2}\right)\right) =$

A. 2^{-4}

B. 2^{-3}

C. 2^{-2}

D. 2^{-1}

Answer: D

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48. If $X = \{1, 2, 3, 4\}$, then one-one onto mappings $f: X \to X$ such that $f(1) = 1$, $f(2) \neq 2f(4) \neq 4$ are given by

A. $f = \{(1, 1), (2, 3), (3, 4), (4, 2)\}$

B. $f = \{(1, 2), (2, 4), (3, 3), (4, 2)\}$

C. $f = \{(1, 2), (2, 4), (3, 2), (4, 3)\}$

D. none of these

Answer: A

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Chapter Test

1. The number of bijective functions from set A to itself when A contains 106 elements is

A. 106

B. $(106)^2$

C. 106!

D. 2^{106}

Answer: C

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2. If $f(x) = |\sin x|$ then domain of f for the existence of inverse of

A. $[0, \pi]$

B. $[0, \pi/2]$

C. $[-\pi/4, \pi/4]$

D. none of these

Answer: B

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3. The functions $f:\left[-\frac{1}{2},\frac{1}{2}\right]\to\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ defined by $f(x)=\sin^{-1}\left(3x-4x^3\right)$ is

A. bijection

B. injection but not a surjection

C. surjection but not and injection

D. neither an injection nor a surjection

Answer: A

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4. Let $f:R\to R$ be a function defined by $f(x)=\frac{e^{|x|}-e^{-x}}{e^{x}+e^{-x}}$, then

A. f is a bijection

B. f is an injection only

C. f is surjection on only

D. f is niether an injection nor a surjection

Answer: D

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5. If $f:(e,\infty)\to R\&f(x)=\log[\log(\log x)]$, then f is -

A. f is one-one but not onto

B. f is but not one-one

C. f is both one-one and onto

D. f is niether one-one nor onto

Answer: C

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6. Let $f: R - \{n\} \to R$ be a function defined by $f(x) = \frac{x-m}{x-n}$ such that $m \neq n$ 1) f is one one into function2) f is one one onto function3) f is many one into funciton4) f is many one onto funcionn then

A. f is one-one onto

B. f is one-one into

C. f is many one onto

D. f is many one into

Answer: B

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7. The inverse of the function $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} + 2$ is given by

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

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

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

D. $\log\left(\frac{x-1}{3-x}\right)^{1/2}$

Answer: D

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8. Find the inverse of the function $:y=\frac{10^x-10^{-x}}{10^x+10^{-x}}+1$

A. $\frac{1}{2}\log_{10}\left(\frac{x}{2-}\right)$

B. $\log_{10}\left(\frac{x}{2-x}\right)$

C. $\frac{1}{2}\log_{10}\left(\frac{x}{1-x}\right)$

D. none of these

Answer: A

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9. Let $f\left(x+\frac{1}{x}\right)=x^2+\frac{1}{x^2},(x\neq 0)$ then f(x) equals

A. x^2- for all x

B. $x^2-2\text{for all}|x|>2$

C. $x^2-2\text{for all}\ \ |x|<2$

D. none of these

Answer: B

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10. Let $f:R\to R, g:R\to R$ be two functions given by $f(x)=2x-3, g(x)=x^3+5$. Then $(fog)^{-1}$ is equal to

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

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

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

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

Answer: A

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11. If $g(x) = 1 + \sqrt{x}$ and $f(g(x)) = 3 + 2\sqrt{x} + x$ then f(x) is equal to

A. $1 + 2x^2$

B. $2 + x^2$

C. $1 + x$

D. 2+x

Answer: B

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12. If $f(x) = \frac{1-x}{1+x}, x \neq 0, -1$ and $\alpha = f(f(x)) + f\left(f\left(\frac{1}{x}\right)\right)$, then

A. $\alpha > 2$

B. $\alpha < -2$

C. $|\alpha| > 2$

D. $\alpha = 2$

Answer: C

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13. Let $f: R \to R$ be a function defined by $f(x) = \frac{x^2 - 8}{x^2 + 2}$. Then f is

A. one-one but not onto

B. one-one and onto

C. one but not one-one

D. neither one-one nor onto

Answer: D

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14. Let $f:(-\infty, 2] \to (-\infty, 4]$ be a function defined by $f(x) = 4x - x^2$. Then, $f^{-1}(x)$ is

A. $2 - \sqrt{4 - x}$

B. $2 + \sqrt{4 - x}$

C. $2 \pm \sqrt{4 - x}$

D. not defined

Answer: A

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15. The inverse of the function of $f:R \to R$ given by $f(x) = \log_a\left(x + \sqrt{x^2 + 1}\right)(a > 0, a \neq 1)$ is

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

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

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

D. not defined

Answer: B

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16. $f: R \to R$ is defined by f(x)= $= \frac{e^{x^2} - e^{-x^2}}{e^{x^2} + e^{-x^2}}$, is

A. one-one but not onto

B. many-one but onto

C. one-one and onto

D. neither one-one nor onto

Answer: A

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17. 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. $\{f(x)\}^4$

C. $2f(x)$

D. $3f(x)$

Answer: C

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18. If $f(x) = \frac{2^x + 2^{-x}}{2}$, then $f(x+y)f(x-y)$ is equals to

A. $\frac{1}{2}\{f(2x) + f(2y)\}$

B. $\frac{1}{2}\{f(2x) - f(2y)\}$

C. $\frac{1}{4}\{f(2x) + f(2y)\}$

D. $\frac{1}{4}\{f(2x) - f(2y)\}$

Answer: A

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19. The function $f: R \to R$ given by $f(x) = x^2 + x$ is

A. one-one nad onto

B. one-one and into

C. many-one and onto

D. many one and into

Answer: D

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20. Let $f: R \to R$ and $g: R \to R$ be given by $f(x) = 3x^2 + 2$ and $g(x) = 3x - 1$ for all $x \to R$. Then,

A. $fog(x) = 27x^2 - 18x + 5$

B. $fog(x) = 27x^2 + 18x - 5$

C. $gof(x) = 9x^2 - 5$

D. $gof(x) = 9x^2 + 15$

Answer: A

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21. The function of $f: R \to R$, defined by $f(x) = [x]$, where [x] denotes the greatest integer less than or equal to x, is

A. one-one

B. onto

C. one-one and onto

D. neither one-one nor onto

Answer: D

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22. Let $f(x) = x, g(x) = 1/x$ and $h(x) = f(x)g(x)$. Then, h(x)=1, if

A. x is any rational number

B. x is a non-zero real number

C. x is a real number

D. x is a rationa number

Answer: B

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23. Let X and Y be subsets of R,the set of all real numbers. The function $f: X \to Y$ defined by $f(x) = x^2$ for $x \in X$ is one-one but not onto if

A. $X = Y = R^+$

B. $X = R, Y = R^+$

C. $X = R^+, Y = R$

D. $X = Y = R$

Answer: C

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24. If the functions of f and g are defined by $f(x) = 3x - 4$ and $g(x) = 2 + 3x$ then $g^{-1}\left(f^{-1}(5)\right)$

A. 1

B. $1/2$

C. $1/3$

D. $1/4$

Answer: C

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25. If $f(x) = \frac{\sin^4 x + \cos^2 x}{\sin^2 x + \cos^4 x}$ for $x \in R$, then f(2010)

A. 1

B. 2

C. 3

D. 4

Answer: A

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26. The function $f: R \to R$ is defined by $f(x) = \cos^2 x + \sin^4 x$ for $x \in R$. Then $f(R)$ is

A. $[3/4, 1)$

B. $(3/4, 1]$

C. $[3/4, 1]$

D. $(3/4, 1)$

Answer: C

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27. $A = \{x / x \in R, x \neq 0, -4 \leq x \leq 4$ and $f: A \to R$ is defined by $f(x) = \frac{|x|}{x}$ for $x \in A$. Then the range of f is

A. {1,-1}

B. $\{x: 0 \leq x \leq 4\}$

C. {1}

D. $\{x: -4 \leq x \leq 0\}$

Answer: A

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28. If $f: R \to R$ and $g: R \to R$ are defined by $f(x) = (2x + 3)$ and $g(x) = x^2 + 7$, then the values of x such that

g(f(x))=8 are

A. 1,2

B. $-1, 2$

C. $-1, \ -2$

D. $1, \ -2$

Answer: C

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29. Let f(x) be defined on [-2,2] and is given by

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

and g(x) $= f(|x|) + |f(x)|$. Then g(x) is equal to

A. $\{-1\}$

B. {0}

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

D. ϕ

Answer: C

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30. The function $f: \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 6^x + 6^{|x|}$ is

A. one-one and onto

B. many one and onto

C. one-one and into

D. many one and into

Answer: D

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