doubtnut
India's Number 1 Education App

MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

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 $g(x) = \alpha x + \beta$, find the values of $\alpha and \beta$.

A. 2x-1

B. 2x+1

C. x+2

D. x-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 $f(x)f(y)-\frac{1}{2}\left[f\left(\frac{x}{y}\right)+f(xy)\right]$ has the value

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 $g(1) = f(1)$, $g(2) - f(2) = 1$and $g(3) - f(3) = 4$ 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. Find for what values of x the following functions would be identical.

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

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:

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

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

Answer: C

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

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

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

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

D. $\phi, (-\infty, 0) \to R$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

$f(x) = x^3 + (a+2)x^2 + 3ax + 5a$ if f(x) is one-one function, then a belong to

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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 surjections 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 $f(1) = 1$, $f(2) \neq 2f(4) \neq 4$ 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: A,B,C

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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 $g(x) = x^2 + x - 2 and \frac{1}{2} gof(x) = 2x^2 - 5x + 2,$ then which is not a possible $f(x)$? $2x - 3$ (b) $-2x + 2$ $x - 3$ (d) None of these

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 function $g(f(x)) = |\sin x|$, then $g(x)$ is equal to (a) $\sqrt{x-1}$ (b) $\sqrt{x}$ (c) $\sqrt{x+1}$ (d) $-\sqrt{x}$

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

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. Show that the function $f: N \to N$ given by, $f(n) = n - (-1)^n$ for all $n \in N$ is a bijection.

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

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 $(a)R$ (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. If $f(x) = \log_{x^2} 25$ and $g(x) = \log_x 5$, then f(x)=g(x) holds, now find the interval for x.

A. R

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

C. ϕ

D. None of these

Answer: B

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8. If $g(f(x)) = |\sin x| and f(g(x)) = \left(\sin\sqrt{x}\right)^2$, then (a). $f(x) = \sin^2 x, g(x) = \sqrt{x}$ (b). $f(x) = \sin x, g(x) = |x|$ (c). $f\left(x = x^2, g(x) = \sin\sqrt{x}\right.$ (d).f $and g$ cannot be determined

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 $f: R\overrightarrow{x \in R: x < 1}$ given by $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$, is $\frac{1}{2}\frac{\log(1+x)}{1-x}$ (b) $\frac{1}{2}\frac{\log(2+x)}{2-x}$ $\frac{1}{2}\frac{\log(1-x)}{1+x}$ (d) None of these

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

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

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

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 $(\text{fo}(\text{fof}))\ (\text{x})$

A. x for all $x \in R$

B. x for all $x \in R-\{1\}$

C. x for all $x \in R-\{0,1\}$

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 $f: R - \{-b\} \to R - \{1\}$ be defined by $f(x) = \frac{x+a}{x+b}$, $a \neq b$, then 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

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

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 $f(x)=\{-1, x<00, x=01, x>0.$

Then for all x, $f(g(x))$ is equal to (where [.] represents the greatest integer function). (a) x (b) 1 (c) $f(x)$ (d) $g(x)$

A. x

B. 1

C. f(x)

D. g(x)

Answer: B

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16. Let $f(x) = \frac{\alpha x}{(x+1)}, x \neq -1.$ for what value of α is $f(f(x)) = x$? (a)$\sqrt{2}$ (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 $f(x) = (x+1)^2$ for $x \geq -1$. 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) equals

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 the functions f, g and h are defined from the set of real numbers R to R such that

$f(x) = x^2 - 1, g(x) = \sqrt{(x^2 + 1)},$

$h(x) = \begin{cases} 0, & \text{if } x < 0 \\ \mathrm{x}, & \text{if } x \geq 0 \end{cases}$

Then find the composite function ho(fog)(x).

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 $f(x) = x + 1,\ \ g(x) = \ -x + 1$ (b) $f(x) = x - 1,\ \ g(x) = x + 1$ (c) $f(x) = \ -x - 1,\ \ g(x) = x - 1$ (d) none of these

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. Find 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 $f: R \to (-1, 1)$ is defined by $f(x) = \frac{-x|x|}{1+x^2}$, then $f^{-1}(x)$ equals $\sqrt{\frac{|x|}{1-|x|}}$ (b) $Sgn(x)\sqrt{\frac{|x|}{1-|x|}}$ (c) $-\sqrt{\frac{x}{1-x}}$ (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

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 onto (b) neither one-one nor onto (c) one-one but not onto (d) onto but not one-one

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 $f(x) = \frac{x}{x+1}$ is (a) one-one and onto (b) one-one but not onto (c) onto but not one-one (d) neither one-one nor onto

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

Watch Video Solution

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 $f(x) = {}^{7-x}P_{x-3}$ is (a) {1, 2, 3, 4, 5} (b) {1, 2, 3, 4, 5, 6} (c) {1, 2, 3, 4} (d) {1, 2, 3}

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 numbers to the set of integers defined by $f(n) = \begin{cases} \frac{n-1}{2}, & when\ n\ is\ odd \\ -\frac{n}{2}, & when\ n\ is\ even \end{cases}$ (a) neither one-one nor onto (b) one-one but not onto (c) onto but not one-one (d) one-one and onto both

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 $f:(-1,1)\overrightarrow{B}$ 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

Watch Video Solution

37. Let $f: N \to Y$ 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. Find its inverse.

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

Watch Video Solution

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

A. one-one and into

B. neither one-one nor onto

C. many-one and onto

D. one-one and onto

Answer: D

Watch Video Solution

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

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 a 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 $f: [0, 3]\overrightarrow{1, 29},$ defined by $f(x) = 2x^3 - 15x^2 + 36x + 1,$ is one-one and onto onto but not one-one one-one but not onto neither one-one nor onto

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] denoutes the greatest interger less than or equal to x, let $f: R \to R$ be defined by $f(x) = 2x + [x] + \sin\cos x,$ 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

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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

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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 $f: [1, \infty) \to [1, \infty)$ defined by $f(x) = 2^{x(x-1)}$ is invertible, find $f^{-1}(x)$.

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

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

Statement 1: The set $\{x : f(x) = f^{-1}(x)\} = \{0, -1\}$.

Statement 2: f is a bijection,

A. 1

B. 2

C. 3

D. 4

Answer: A

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

A. 1

B. 2

C. 3

D. 4

Answer: A

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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

Watch Video Solution

10. Let f be a function defined by $f(x) = (x-1)^2 + 1, (x \geq 1)$.

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

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

A. 1

B. 2

C. 3

D. 4

Answer: A

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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 be given by

$$f(x) = \begin{cases} -1, & -2 \leq x \leq 0 \\ x - 1, & 1 < x \leq 2 \end{cases} \text{ and } g(x) = f(|x|) + |f(x)|.$$

Then find $g(x)$.

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

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

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

D. none of these

Answer: B

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

$f(x) = x^3$ (b) $f(x) = x + 2$ $f(x) = 2x + 1$ (d) $f(x) = x^2 + x$

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 $A = \{x \in R : -1 \leq x \leq 1\}$ to itself are bijections? $f(x) = |x|$ (b) $f(x) = \frac{\sin(\pi x)}{2}$ (c) $f(x) = \frac{\sin(\pi x)}{4}$ (d) none of these

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 $f: R \to R$ is a function defined by $f(x) = x^3 + 5$ then $f^{-1}(x)$ is

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 the bijective functions. Then $(gof)^{-1}$ is

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

B. fog

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

D. gof

Answer: C

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

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

A. one-one onto

B. many one onto

C. one-one but not onto

D. none of these

Answer: C

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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. Let $f: R - \left\{\frac{3}{5}\right\} \to R$ be defined by $f(x) = \frac{3x+2}{5x-3}$. Then (a).f^-1(x)=f(x). (b).f-1(x)= -f(x). (c). (fof)=x (d). f-1(x)=(1/19)f(x)

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 $f(x) = 2^x, \text{then} f(0), f(1), f(2) \ldots \text{are in}$

A. AP

B. GP

C. HP

D. arbitrary

Answer: B

Watch Video Solution

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? (a) $f(x) = \frac{1-x}{1+x}$ (b) $f(x) = 5^{\log x}$ (c) $f(x) = 2^{x(x-1)}$ (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:

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 (a)$f(3x)$ (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 $y = f(x) = \frac{x-1}{x^2-3x+3}$ 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. 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)

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)

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 injective 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 $f(x) = \{x, \xi srational 1 - x, \xi sirrational, then f(f(x))$ is $x \forall x \in R$ (b) $\{x, \xi sirrational 1 - x, \xi srational$ $\{x, \xi srational 1 - x, \xi sirrational$ (d) none of these

A. constant

B. 1+x

C. x

D. none of these

Answer: C

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23. Let f (x) =x and g (x) = |x| for all . Then the function 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. about to only mathematics

A. $d = -a$

B. d=a

C. $a = b = c = d = 1$

D. $a = b = 1$

Answer: A

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25. If $f(x) = \left(ax^2 + b\right)^3$, the function g such that $f(g(x)) = g(f(x))$, 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. $g(x) = (ax^2 + b)^{1/3}$

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

Answer: D

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26. If a function $f: [2, \infty) \to R$ is defined by $f(x) = x^2 - 4x + 5$, then the range of f is

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. If function $f: R \to R$ is defined by $f(x) = 3x - 4$ then $f^{-1}(x)$ is given by

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 $\rightarrow$ R is a function defined by f (x) = 10 x - 7. If g = f^{-1}, then g(x) equals

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

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

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

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

Answer: C

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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 $1 + \sqrt{1 - x}$ (b) $1 - \sqrt{1 - x}$ (c) $\sqrt{1 - x}$ (d) $1 \pm \sqrt{1 - x}$

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 $\frac{1}{x - [x]}$ (b) $[x] - x$ (c) not defined (d) none of these

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

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

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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 $f: A \to B$ and $g: B \to C$ 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

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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

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43. Suppose $f: A \to B \quad \text{and} \quad B \to C$.

(i) Prove that if f is onto and g is not one-one, then gof is not one-to-one

(ii) Prove that if f is not and g is one-one, then gof is not onto.

A. f is one-one

B. g is one-one

C. f and g both are one-one

D. none of these

Answer: B

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44. If $f: A \to B$ and $g: B \to C$ 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

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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 $h(x)=2x,\ \frac{1}{2}\le x\le\frac{1}{\sqrt{2}}$, then $fogoh\,(x)=\pi/2$ (b) $fogoh\,(x)=\pi$ (c) $hofog=hogof$ (d) $hofog\neq hogof$

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

B. fogoh(x)=π

C. hofog=hogof

D. $hofog\neq fogof$

Answer: C

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

A. hogof=fogoh

B. gofoh=fohog

C. fohog=hogof

D. none of these

Answer: D

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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 $f(1) = 1, f(2) \neq 2 f(4) \neq 4$ 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 function $f:[-1/2,\ 1/2] \to [-\pi/2, \pi/2]$ defined by $f(x) = s \in^{-1} (3x - 4x^3)$ is (a) bijection (b) injection but not a surjection (c) surjection but not an injection (d) neither an injection nor a surjection

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, f is a bijection (b) f is an injection only (c) f is surjection on only (d) f is neither an injection nor a surjection

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 and onto

(b)f is one-one but onto

(c)f is onto but not one-one

(d)the range of f is equal to its domain

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 $f(x)=\frac{x-m}{x-n}$, where $m\neq n$. Then, f is one-one onto (b) f is one-one into (c) f is

many one onto (d) f is many one into

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. Find the inverse of the function: $f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} + 2$

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. $x^2 - 2$for all$|x| > 2$

C. $x^2 - 2$for all $|x| < 2$

D. none of these

Answer: B

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10. Let f : R $\rightarrow$ R, g : R $\rightarrow$ R be two functions given by f(x) = 2x - 3, g(x) = x^3 + 5. Then, $(fog)^{-1}$(x) 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. If $f:(-\infty, 2] \to (-\infty, 4]$ where $f(x)$, then $f^{-1}(x)$ is given by :

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. Find the inverse of the function, (assuming onto).

$$y = \log_a\left(x + \sqrt{x^2 + 1}\right), (a > 1).$$

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

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 $\frac{1}{2}\{f(2x) + f(2y)\}$ (b) $\frac{1}{2}\{f(2x) - f(2y)\}$ (c) $\frac{1}{4}\{f(2x) + f(2y)\}$ $\frac{1}{4}\{f(2x) - f(2y)\}$

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 $f(x) = x, g(x) = \frac{1}{x}$ and $h(x) = f(x)g(x)$. Then $h(x) = 1$ for a.$x \in R$ b. $x \in Q$ c. $x \in R - Q$ d. $x \in R, x \neq 0$

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

A. $[3/4, 1]$

B. $(3/4, 1]$

C. $[3/4, 1]$

D. $(3/4, 1)$

Answer: C

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26. $A = \{x/x \in R, x \neq 0, -4 \leq x \leq 4$ 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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27. If $f: R\overrightarrow{R}$ and $g: R\overrightarrow{R}$ are defined by $f(x) = 2x + 3 and g(x) = x^2 + 7,$ then the value of x such that $g(f(x)) = 8$ a,1, 2 b.$-1, 2$ c.$-1, -2$ d.$1, -2$

A. 1,2

B. $-1, 2$

C. $-1, -2$

D. $1, -2$

Answer: C

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

$$f(x) = \begin{cases} -1, & -2 \leq x \leq 0 \\ x - 1, & 1 < x \leq 2 \end{cases} \text{ and } g(x) = f(|x|) + |f(x)|.$$

Then find $g(x)$.

A. $\{-1\}$

B. {0}

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

D. ϕ

Answer: C

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29. The function $f: R \to R$ 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

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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