



India's Number 1 Education App

MATHS

BOOKS - DISHA PUBLICATION MATHS (HINGLISH)

RELATIONS AND FUNCTIONS

Jee Main 5 Years At A Glance

1. Let $f(n) = \left[\frac{1}{2} + \frac{n}{100} \right]$ where $[n]$ denotes the integral part of n . Then the value of $\sum_{n=1}^{100} f(n)$ is

A. 56

B. 689

C. 1287

D. 1399

Answer: D



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2. The range of the function $f(x) = \frac{x}{1 + |x|}$, $x \in R$, is

A. R

B. (-1,1)

C. R - (0)

D. [-1,1]

Answer: B



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3. The domain of the function

$$f(x) = \frac{1}{\sqrt{|x| - x}}, \text{ is}$$

- A. $(0, \infty)$
- B. $(-\infty, 0)$
- C. $(-\infty, \infty) - \{0\}$
- D. $(-\infty, \infty)$

Answer: B



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4. A real valued function $f(x)$ satisfies the functional equation

$f(x - y) = f(x)f(y) - f(a - x)f(a + y)$, where a is a given constant and $f(0), f(2a-x) =$

A. $-f(x)$

B. $f(x)$

C. $f(a) + f(a -x)$

D. $f(-x)$

Answer: A



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5. If the graph of the function $y = f(x)$ is symmetrical about the line $x = 2$, then

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

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

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

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

Answer: B



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6. The domain of the definition of the function

$$f(x) = \frac{1}{4 - x^2} + \log_{10}(x^3 - x)$$

A. $(-1, 0) \cup (1, 2) \cup (2, \infty)$

B. $(a, 2)$

C. $(-1, 0) \cup (a, 2)$

D. $(1, 2) \cup (2, \infty)$

Answer: A



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7. If $f: R \rightarrow R$ satisfies $f(x+y)=f(x)+f(y)$, for all $x, y \in R$ and $f(1)=7$,

then $\sum_{r=1}^n f(r)$ is

A. $\frac{7n(n + 1)}{2}$

B. $\frac{7n}{2}$

C. $\frac{7(n + 1)}{2}$

D. $7n + (n + 1)$

Answer: A



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Exercise 1

1. If $(4x + 3, y) = (3x + 5, -2)$, then the sum of the values of x and y is

A. 0

B. 2

C. -2

D. 1

Answer: A



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2. If the set A has p elements, B has q elements, then the number of elements in $A \times B$ is

A. $p + q$

B. $p + q + 1$

C. pq

D. p^2

Answer: C



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3. The relation R defined on the set $A = \{1, 2, 3, 4, 5\}$ by

$R = \{(x, y) : |x^2 - y^2| < 16\}$ is given by

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

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

C. $\{(3, 3), (3, 4), (5, 4), (4, 3), (3, 1)\}$

D. None of these

Answer: D



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4. The relation on the set $A = \{x|x| < 3, x, \in Z\}$ is defined by

$R = \{(x, y); y = |x|, x \neq -1\}$, Then the numbers of elements in the power set of R is

- A. $\{(-2,2), (-1,1), (0,0), (1,1) ,(2,2)\}$
- B. $\{(-2, -2), (-2, 2), (-1, 1), (0, 0), (1, -2), (1, 2), (2,-1), (2,-2)\}$
- C. $\{(0, 0), (1, 1), (2, 2)\}$
- D. None of these

Answer: A



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5. If A is the set of even natural number less than 8 and B is the set of prime numbers less than 7, then the number of relations from A to B is 2^9 (b) 9^2 (c) 3^2 (d) $2^9 - 1$

A. 2^9

B. 9^2

C. 3^2

D. $2^9 - 1$

Answer: A



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6. Let R be the relation on Z defined by $R = \{(a, b) : a, b \in Z, ab$ is an integer}. Find the domain and range of R.

A. Domain of R is $\{2, 3, 4, 5\ldots\}$

B. range of R is Z

C. Both (a) and (b)

D. None of these

Answer: D



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7. If the set A has 3 elements and the set $B = \{3, 4, 5\}$, then find the number of elements in $(A \times B)$.

A. Only I is true.

B. Only II is true.

C. Both I and II are true.

D. Both I and II are false.

Answer: A



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8. Find the domain and range of $f(x) = \frac{x}{x + 2}$



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9. For the following relation

$$R = \{(0, 0), (0, 1), (1, 1), (2, 1), (2, 2), (2, 0), (1, 0), (0, 2), (0, 1)\}$$

A. domain = {0,1}

B. range = {0,1,2}

C. both correct

D. None of these

Answer: B



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10. Let R be a relation from N to N defined by

$R = \{(a, b) : ab \in N \text{ and } a = b^2\}$. Are the following true?

(i) $(a, a) \in R$, (ii) $\forall a \in N (a, a) \in R$, (iii) $(a, b) \in R \implies (b, a) \in R$

(a,

A. I and II are true

B. II and III are true

C. All are true

D. None of these

Answer: D



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11. Consider the following statements.

- I. The relation $R = \{(x, x^3) : x \text{ is a prime number less than } 10\}$
- II. The range of the relation

$R = \{(x+2, x+4), x \in \mathbb{N}, x < 8\}$ is $\{1,2,3,4,5,6,7\}$.

Choose the correct option.

A. Only I is true.

B. Only II is true.

C. Both are true

D. Both are false

Answer: D



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12. Figure 2.14 shows a relation R between the sets P and Q .

Write this relation R in i. Roster form ii. Set builder form. What is this domain and range?

- A. Only I and II are true.
- B. Only II and III are true.
- C. I, II and III are true
- D. Neither I, II nor III are true.

Answer: C



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13. The domain of relation

$$R = \{(x,y) : x^2 + y^2 = 16, x, y \in \mathbb{Z}\}$$

A. {0, 1, 2, 3, 4}

B. {-4, -3, -2, -1}

C. {-4, -3, -2, -1, 0, 1, 2, 3, 4}

D. {0, 4, -4}

Answer: D



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14. If $A = \{a, b, c, d\}$, $B = \{1, 2, 3\}$, Which of the following sets of ordered pairs are not relations from A to B ?

A. {(a, 1), (a, 3)}

B. {(b, 1), (c, 2), (d, 1)}

C. {(a, 2), (b, 3), (3, b)}

D. {(a, 1), (b, 2), (c, 3)}

Answer: C



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15. If $A = \{1,2,4\}$, $B = \{2,4,5\}$, $C = \{2,5\}$, then $(A - C) \times (B - C)$ is equal to

- A. $\{(1,4)\}$
- B. $\{(1,4), (4,4)\}$
- C. $\{(4,1), (4,4)\}$
- D. $\{(1,2),(2,5)\}$

Answer: B



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16. If $(A \times A)$ has 9 elements two of which are $(-1,0)$ and $(0,1)$, find the set A and the remaining elements of $(A \times A)$.

- A. $\{(-1,1),(0, 0), (-1,-1), (1-1), (0,-1)\}$
- B. $\{(-1, -1)(0,0),(-1, 1),1,-1), (1, 0),(1, 1), (0,-1)\}$
- C. $\{(1,0), (0,-1), (0, 0), (-1,-1), (1,-1), (1, 1)\}$
- D. None of these

Answer: B



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17. the value of the function $f(x) = \frac{x^2 - 3x + 2}{x^2 + x - 6}$ lies in the interval.

A. $(-\infty, \infty) - \left\{ \frac{1}{5}, 1 \right\}$

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

C. $(-\infty, \infty) - \{1\}$

D. None of these

Answer: B



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18. Let $A = \{1,2,3,4\}$, $B = \{1,5,9,11,15,16\}$ and $f = \{(1,5), (2,9),(3,1),(4,5), (2,11)\}$. Then ,

A. f is a relation from A to B

B. f is a function from A to B

C. Both (a) and (b)

D. None of these

Answer: A



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19. Which of the following relation is a function ?

A. $\{(a,b) (b,e)(c,e) (b,x)\}$

B. $\{(a,d)(a,b)(b,e)(a,b)\}$

C. $\{(a,d)(b,e)(c,d)(e,x)\}$

D. $\{(a,b)(b,m)(b,y)(d,x)\}$

Answer: C



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

A. $\{0, 2\}$

B. $\left\{\frac{1}{2}, -2\right\}$

C. $\left\{-\frac{1}{2}, 2\right\}$

D. $\left\{\frac{1}{2}, 2\right\}$

Answer: B



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21. The domain of the function $f(x) = \frac{1}{\sqrt{9 - x^2}}$ is

A. $-3 \leq x \leq 3$

B. $-3 < x < 3$

C. $-9 \leq x \leq 9$

D. $-9 < x < 9$

Answer: B

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22. There are three relations R_1 , R_2 and R_3 such that

$$R_1 = \{(2, 1), (3, 1), (4, 2)\},$$

$$R_2 = \{(2, 2), (2, 4), (3, 3), (4, 4)\} \text{ and}$$

$$R_3 = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7)\}$$

then

A. R_1 and R_2 are functions

B. R_2 and R_3 are functions

C. R_1 and R_3 are functions

D. Only R_1 is a function

Answer: C

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23. The domain of definiton of the function

$$f(x) = \frac{1}{\sqrt{x^{12} - x^9 + x^4 - x + 1}}, \text{ is}$$

A. $(-\infty, -1)$

B. $(1, \infty)$

C. $(-1, 1)$

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

Answer: D

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24. The domain and range of the real function f defined by

$$f(x) = \frac{4-x}{x-4} \text{ is}$$

- A. Domain = R , Range = {-1,1}
- B. Domain = R - {1}, Range = R
- C. Domain = R - {4} , Range = {-1}
- D. Domain = R - {-1}, Range = {-1,1}

Answer: C



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25. Let N be the set of natural numbers and the relation R be

defined on N such that $R = \{(x, y) : y = 2x, x, y \in N\}$. What is

the domain, codomain and range of R? Is this relation a function?

- A. R is a function
- B. R is not a function
- C. domain , range and co-domain is N
- D. None of the above

Answer: A



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26. The domain of the function $f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$ is

- A. R
- B. R - { 1,4 }

C. $\mathbb{R} - \{1\}$

D. $(1,4)$

Answer: B



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27. The domain of the function f given by $f(x) = \frac{x^2 + 2x + 1}{x^2 - 5x + 6}$

A. $\mathbb{R} - \{3, -2\}$

B. $\mathbb{R} - \{-3, 2\}$

C. $\mathbb{R} - \{3, -2\}$

D. $\mathbb{R} - \{3, -2\}$

Answer: A



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28. Find the domain of $f(x) = \sqrt{(\log)_{0.4}\left(\frac{x-1}{x+5}\right)}$

- A. $(1, \infty)$
- B. $(3, \infty)$
- C. $(-1, \infty)$
- D. $(2, \infty)$

Answer: A



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

- A. $f(a^2)$

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

C. $f(-a)$

D. $f\left|\frac{-a}{a-1}\right|$

Answer: A



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30. If $\phi(x) = a^x$, then $[\phi(p)]^3$ is equal to:

A. $\phi(3p)$

B. $3\phi(p)$

C. $6\phi(p)$

D. $2\phi(P)$

Answer: A



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31. The function $f(x) = \log\left(x + \sqrt{x^2 + 1}\right)$ is

- A. neither an even nor an odd function
- B. an even function
- C. an odd function
- D. a periodic function

Answer: C



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32. The domain of the function $f(x) = \frac{|x + 3|}{x + 3}$ is

- A. $\{-3\}$

B. $\mathbb{R} - \{-3\}$

C. $\mathbb{R} - \{3\}$

D. \mathbb{R}

Answer: B



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33. If $3f(x) - f\left(\frac{1}{x}\right) = \log x^4$, then $f(e^{-x})$ is

A. $1 + x$

B. $1/x$

C. x

D. $-x$

Answer: D



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34. If $f(x) = x^3 - \frac{1}{x^3}$ then $f(x) + f\left(\frac{1}{x}\right)$ is equal to

A. $2x^3$

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

C. -1

D. 0

Answer: D



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35. Is $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ a function? If this is described by the formula, $g(x) = \alpha x + \beta$, then what values

should be assigned to α and β ?

- A. $\alpha = 1, \beta = 1$
- B. $\alpha = 2, \beta = -1$
- C. $\alpha = 1, \beta = -2$
- D. $\alpha = -2, \beta = -1$

Answer: B



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36. If $f(y) = 2y^2 + by + c$ and $f(0) = 3$ and $f(2) = 1$, then the value of $f(1)$ is

A. 0

B. 1

C. 2

D. 3

Answer: A



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37. The domain of definition of the function

$$y = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2} \text{ is}$$

A. (-3,-2) excluding -2.5

B. [0,1]excluding 0.5

C. [-2,1] excluding 0

D. None of these

Answer: C



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38. Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a linear function from Z into Z , then $f(x) =$

A. $2x - 1$

B. $2x$

C. $2x + 1$

D. $-2x + 1$

Answer: A



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39. If $f(x) = \frac{1}{\sqrt{(x+1)(e^x-1)(x-4)(x+5)(x-6)}}$, then the domain of $f(x)$ is

A. $(\infty, -5) \cup (-1, 4) \cup (6, \infty)$

B. $(-\infty, -5) \cup (-1, 0) \cup (0, 4) \cup (6, \infty)$

C. $(-5, -1) \cup (0, 4) \cup (6, \infty)$

D. None of these

Answer: C



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40. If f and g are two functions defined as $f(x) = x + 2, x \leq 0, g$

$(x) = 3, x \geq 0$, then the domain of $f + g$ is

A. $\{0\}$

B. $[0, \infty)$

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

D. $(-\infty, 0)$

Answer: A



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41. If $f(x + 1) = x^2 - 3x + 2$ then $f(x)$ is equal to

A. $x^2 - 5x - 6$

B. $x^2 + 5x - 6$

C. $x^2 + 5x + 6$

D. $x^2 - 5x + 6$

Answer: D



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42. $f(x) = \frac{x(x - p)}{q - p} + \frac{x(x - q)}{p - q}$, $p \neq q$. What is the value of $f(p) + f(q)$?

A. $f(p - q)$

B. $f(p + q)$

C. $f(p(p + q))$

D. $f(q(p - q))$

Answer: B



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43. If $[x]^2 - 5[x] + 6 = 0$, where $[.]$ denotes the greatest integer function, then $x \in [3, 4]$ (b) $x \in (2, 3]$ (c) $x \in [2, 3]$ (d) $x \in [2, 4)$

A. $x \in [3,4]$

B. $x \in (2,3]$

C. $x \in [2,3]$

D. $x \in [2,4)$

Answer: D



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44. The domain of the function

$$f(x) = \frac{1}{\sqrt{|x| - x}}, \text{ is}$$

A. $(0, \infty)$

B. $(-\infty, 0)$

C. $(-\infty, \infty) - \{0\}$

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

Answer: B

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

A. 0 for all $a \in \mathbb{R}$

B. $2x$ for all $x \in \mathbb{R}$

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

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

Answer: C

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46. If $f(x) = e^{-x}$, then $\frac{f(-a)}{f(b)}$ is equal to

A. $f(a + b)$

B. $f(a - b)$

C. $f(-a + b)$

D. $f(-a - b)$

Answer: D



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47. If $P = \{x \in R : f(x) = 0\}$ and $Q = \{x \in R : g(x) = 0\}$,
then $P \cup Q$ is

A. $\{x \in R : f(x) + g(x) = 0\}$

B. $\{x \in R : f(x)g(x) = 0\}$

C. $\left\{x \in R : (f(x))^2 + (g(x))^2 = 0\right\}$

D. None of these

Answer: B



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48. The domain of the function $f(x) = \frac{|x + 3|}{x + 3}$ is

A. $\{-3\}$

B. $R - \{-3\}$

C. $R - \{3\}$

D. R

Answer: B



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49. let $f(x) = \sqrt{1 + x^2}$ then

A. $f(xy) = f(x) \cdot f(y)$

B. $f(xy) \geq f(x) \cdot f(y)$

C. $f(xy) \leq f(x) \cdot f(y)$

D. None of these

Answer: C



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50. The function $f(x) = \log_{10} \left(\frac{1+x}{1-x} \right)$ satisfies the equation

A. $f(x+2) - 2f(x+1) + f(x) = 0$

B. $f(x + 1) + f(x) = f(x(x+1))$

C. $f(x_1) \cdot f(x_2) = f(x_1 + x_2)$

D. $f(x_1) + f(x_2) = f\left(\frac{x_1 + x_2}{1 + x_1x_2}\right)$

Answer: D



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51. If $f(x + y) = f(x) + 2y^2 + kxy$ and $f(a) = 2, f(b) = 8$, then $f(x)$ is of the form

A. $2x^2$

B. $2x^2 + 1$

C. $2x^2 - 1$

D. x^2

Answer: A



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52. Let $f_1(x) = \begin{cases} x, & x \leq x \leq 1 \\ 1, & x > 1 \\ 0, & \text{otherwise} \end{cases}$

$f_2(x) = f_1(-x)$ for all x and $f_3(x) = -f_2(x)$ for all x and
 $f_4(x) = -f_3(-x)$ for all x . Which of the following is necessarily true?

- A. $f_4(x) = f_1(x)$ for all x
- B. $f_1(x) = -f_3(-x)$ for all x
- C. $f_2(-x) = f_4(x)$ for all x
- D. $f_1 + (x) = f_3(x) = 0$ for all x

Answer: B



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53. The domain of the function

$$f(x) = \frac{1}{\sqrt{|x| - x}}, \text{ is}$$

A. \mathbb{R}

B. \mathbb{R}^+

C. \mathbb{R}^{-1}

D. $\{\phi\}$

Answer: D



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54. Let $f(x) = \frac{\alpha x^2}{x + 1}$, $x \neq -1$, The value of α for which $f(a) = a$, ($a \neq 0$) is

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

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

C. $1 + \frac{1}{a}$

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

Answer: C



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55. The domain of the function $f(x) = \exp\left(\sqrt{5x - 3 - 2x^2}\right)$ is

A. $[3/2, \infty)$

B. $[1, 3/2]$

C. $(-\infty, 1]$

D. $(1, 3/2)$

Answer: B



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56. If $f: R \rightarrow R$ be defined as $f(x) = 2x + |x|$, then $f(2x) + f(-x) - f(x)$ is equal to

A. $2x$

B. $2|x|$

C. $-2x$

D. $-2|x|$

Answer: B



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57. Domain of definition of the function

$$f(x) = \frac{3}{4-x^2} + \log_{10}(x^3 - x), \text{ is:}$$

A. $(-1, 0) \cup (1, 2) \cup (2, \infty)$

B. (a,2)

C. $(-1, 0) \cup (a, 2)$

D. $(1, 2) \cup (2, \infty)$

Answer: A



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58. Which of the following is wrong ?

A. Every constant function is an even function

B. A constant function may be odd function also.

C. Every constant function is an odd as well as an even function.

D. Every constant function is a periodic function

Answer: C



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

$$f(x) = \begin{cases} x + 1 & -2 \leq x \leq 0 \\ x - 1 & 0 \leq x \leq 2 \end{cases}, \text{ then } f(|x|) \text{ is defined as}$$

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

B. $f(|x|) = x - 1 \quad \forall x \in \mathbb{R}$

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

D. None of these

Answer: C



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60. The domain for which the functions defined by $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal to :

- A. $\left[-1, \frac{4}{3} \right]$
- B. $\left[1, \frac{4}{3} \right]$
- C. $\left[-1, -\frac{4}{3} \right]$
- D. $\left[-2, -\frac{4}{3} \right]$

Answer: A



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Exercise 2

1. If $A = \{1, 2\}$, $B = \{1, 3\}$, then $(A \times B) \cup (B \times A)$ is equal to

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

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

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

D. None of these

Answer: A



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2. Which of the following relation is NOT a function ?

A. $f = \{ (x, x) \mid x \in R \}$

B. $g = \{ (x, 3) \mid x \in R \}$

C. $h = \left\{ \left(n, \frac{1}{n} \right) \mid n \in I \right\}$

D. $t = \{ (n, n^2) \mid n \in N \}$

Answer: C



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3. The range of the function $f(x) = \frac{e^x - e^{|x|}}{e^x + e^{|x|}}$ is $(-\infty, \infty)$

(b) $[0, 1]$ (d) $(-1, 1)$

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

B. $[0, 1)$

C. $(-1, 0]$

D. (-1,1)

Answer: C

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4. Let $X = \{1, 2, 3, 4, 5\}$ and $Y = \{1, 3, 5, 7, 9\}$. Which of the following is not a relation from X to Y

- A. $R_1 = \{(x, y), y = x + 2, x \in X, y \in Y\}$
- B. $R_2 = \{(1, 1), (2, 1), (3, 3), (4, 3), (5, 5)\}$
- C. $R_3 = \{(1, 1), (1, 3), (3, 5), (3, 7), (5, 7)\}$
- D. $R_4 = \{(1, 3), (2, 5), (2, 4), (7, 9)\}$

Answer: D

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5. Find the domain of $f(x) = \sqrt{(0.625)^{4-3x} - (1.6)^{x(x+8)}}$

A. [-3,2]

B. [1,4]

C. [2,5]

D. [-4,-1]

Answer: D



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6. Let $f(x) = \frac{x}{1-x}$ and let α be a real number. If $x_0 = \alpha$, $x_1 = f(x_0)$, $x_2 = f(x_1)$, and $x_{2011} = -\frac{1}{2012}$ then the value of α is

A. 0

B. $\frac{2009}{2010}$

C. $\frac{1}{2009}$

D. $\frac{1}{2010}$

Answer: D



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7. The domain and range of the relation R given by

$$R = \{(x, y) : y = x + \frac{6}{x}, \text{ where } x, y \in N \text{ and } x < 6\} \text{ is}$$

A. { 1,2,3}, { 7, 5}

B. { 1,2}, { 7, 5}

C. { 2,3}, { 5}

D. None of these

Answer: A



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8. Find the range of $f(x) = \operatorname{sgn}(x^2 - 2x + 3)$.

- A. {1, -1}
- B. {1}
- C. {-1}
- D. None of the above

Answer: B



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9. The domain of definition of the function $y(x)$ is given by the equation $2^x + 2^y = 2$, is

- A. $0 < x \leq 1$
- B. $0 \leq x \leq 1$
- C. $-\infty < x \leq 0$
- D. $-\infty < x < 1$

Answer: D



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10. A, B and C are three different sets and $A \times (B \cap C) = (A \times B) \cap (A \times C)$. Judge the given statements by taking any three non empty sets A,B and C (True/False).

A. $A \times (B \cap C) = (A \times B) \cap (A \times C)$

B. $A \times (B' \cup C')' = (A \times B) \cap (A \times C)$

C. Both (a) and (b)

D. None of these

Answer: C



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11. Let f be a function on \mathbb{R} given by $f(x) = x^2$ and let $E =$

$\{x \in \mathbb{R} : -1 \leq x \leq 0\}$ and $F = \{x \in \mathbb{R}, 0 \leq x \leq 1\}$

then which of the following is false ?

A. $f(E) = f(F)$

B. $E \cap F \supset f(E) \cap f(F)$

C. $E \cup F \supset f(E) \cup f(F)$.

D. $f(E \cap F) = \{0\}$

Answer: B

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12. Let $f(x) = \frac{x}{1+x^2}$ and $g(x) = \frac{e^{-x}}{1+[x]}$, where $[x]$ is the greatest integer less than or equal to x . Then

A. DU ($f + g$) = R - [-2, 0)

B. DU ($f + g$) = R - [-1, 0)

C. $R(f) \cap R(g) = \left(-2, \frac{1}{2}\right)$

D. None of these

Answer: B

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13. The relation R defined on the set $A = \{1, 2, 3, 4, 5\}$ by

$$R = \{(a, b) : |a^2 - b^2| < 16\} \text{ is given by}$$

- A. $\{(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)\}$
- B. $\{(2, 2), (3, 2), (4, 2), (2, 4)\}$
- C. $\{(3, 3), (4, 3), (5, 4), (3, 4)\}$
- D. None of these

Answer: D



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14. Let $f(x) = [x]$, where $[x]$ denotes the greatest integer less than or equal to x . If $a = \sqrt{2011^2 + 2012}$, then the value of $f(x)$ is equal to

A. 2010

B. 2011

C. 2012

D. 2013

Answer: B



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15. Define relations R_1 and R_2 on set $A = [2,3,5,7,10]$ as xR_1y is

$2x = (y - 1)$ and xR_2y if $x + y = 10$, then the relation R given by

$R = R_1 \cap R_2$ is

A. $\{\}$

B. $\{3,7\}$

C. $\{(3,7),(5,5)\}$

D. None of these

Answer: B

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16. A relation R is defined in the set Z of integers as follows (x, y)

$\in R$ iff $x^2 + y^2 = 9$. Which of the following is false ?

A. $R = \{ (0,3), (0,-3), (3,0), (-3,0) \}$

B. Domain of R = { - 3, 0, 3}

C. Range of R = {-3, 0, 3}

D. None of these

Answer: D

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17. The domain of the function

$$f(x) = \sqrt{x^2 - 5x + 6} + \sqrt{2x + 8 - x^2}, \text{ is}$$

A. [- 4, -3]

B. [- 3, -2]

C. [- 2, 2]

D. [3,4]

Answer: D



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18. The real valued function $f(x) = \frac{a^x - 1}{x^n(a^x + 1)}$ is even, then

the value of n can be

A. 2

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

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

D. 3

Answer: D



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19. the value of the function $f(x) = \frac{x^2 - 3x + 2}{x^2 + x - 6}$ lies in the interval.

A. $(-\infty, \infty) - \left\{ \frac{1}{5}, 1 \right\}$

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

C. $(-\infty, \infty) - \{1\}$

D. None of these

Answer: B



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20. The domain of $f(x) = \log(|x - 2| - 2 | - 1)$ is

A. $\mathbb{R} - (1,3)$

B. $(-\infty, -1) \cup (1, 3) \cup (5, \infty)$

C. $(5, \infty)$

D. None of these

Answer: B



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21. If $f: R \rightarrow R$ satisfies $f(x+y)=f(x)+f(y)$, for all $x, y \in R$ and $f(1)=7$, then $\sum_{r=1}^n f(r)$ is

A. $\frac{7n(n + 1)}{2}$

B. $\frac{7n}{2}$

C. $\frac{7(n + 1)}{2}$

D. $7n + (n + 1)$

Answer: A



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22. Find the domain of the following functions:

$$f(x) = \sqrt{\left(\frac{2}{x^2 - x + 1} - \frac{1}{x + 1} - \frac{2x - 1}{x^3 + 1} \right)}$$

A. $(-\infty, 2] - \{-1\}$

B. $(-\infty, 2)$

C. $[-1, 2]$

D. None of these

Answer: A



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23. Which of the following functions is even,

A. $f(x) = \sqrt{1+x+x^2} - \sqrt{1-x+x^2}$

B. $f(x) = \log\left(\frac{1-x}{1+x}\right)$

C. $f(x) = \log\left(x + \sqrt{1+x^2}\right)$

D. $f(x) = \frac{e^x + e^{-x}}{2}$

Answer: D



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24. If $f(1) = 1$ and $f(n + 1) = 2f(n) + 1$, if $n \geq 1$, then $f(n)$ is.

A. 2^{n+1}

B. 2^n

C. 2^{n-1}

D. $2^{n-1} - 1$

Answer: C



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25. The range of the function $f(x) = \frac{x^2 - x + 1}{x^2 + x + 1}$ where $x \in R$,
is

A. $(-\infty, 3]$

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

C. $[3, \infty)$

D. $\left[\frac{1}{3}, 3\right]$

Answer: D



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26. Verify that $x \operatorname{sgn} x = |x|$ $|x| \operatorname{sgn} x = x$ $x(\operatorname{sgn} x)(\operatorname{sgn} x) = x$

A. $x \operatorname{sgn} x = |x|$

B. $|x| \operatorname{sgn} x = x$

C. $x(\operatorname{sgn} x)(\operatorname{sgn} x) = x$

D. $|x| (\operatorname{sgn} x)^3 |x|$

Answer: D



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27. The domain of the function $f(x) = 3\sqrt{\frac{x}{1 - |x|}}$

A. $(-\infty, -1) \cup (-1, 1)$

B. $(-\infty, -1)$

C. $[0, \infty)$

D. None of these

Answer: A



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28. The domain of the function

$$f(x) = \sqrt{x^{14} - x^{11} + x^6 - x^3 + x^2 + 1}$$
 is

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

B. $[0, \infty)$

C. $(-\infty, 0]$

D. $\mathbb{R} / [0, 1]$

Answer: A



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29. If f is any function, then $\frac{1}{2}[f(x) + f(-x)]$ is always

A. even

B. odd

C. neither even nor odd

D. None of these

Answer: A



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30. The function f satisfies the functional equation $3f(x) + 2f\left(\frac{x+59}{x-1}\right) = 10x + 30$ for all real $x \neq 1$. The value of $f(7)$ is (a) 8 (b) 4 (c) -8 (d) 11

A. 9

B. 4

C. 8

D. 11

Answer: B



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