MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

SETS RELATIONS AND FUNCTIONS

Exercise 1 1

1. Write the in roster form.

{x $\in \mathbb{N}: x^2 < 121$ and x is a prime}.

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2. Write the in roster form.

the set of all positive roots of the equation (x-1) (x+1) $\left(x^2 - 1\right)$=0.

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3. Write the in roster form.

$\{x \in \mathbb{N} : 4x + 9 < 52\}$.

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4. Write the in roster form.

$$\left\{x : \frac{x-4}{x+2} = 3, x \in \mathbb{R} - \{-2\}\right\}$$

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5. Write the set {-1,1} in set builder form.

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6. State whether the sets are finite or infinite.

$\{x \in \mathbb{N}$: x is an even prime number $\}$

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7. State whether the sets are finite or infinite.

$\{x \in \mathbb{N}$: x is an odd prime number $\}$

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8. State whether the sets are finite or infinite.

$\{x \in Z$: x is even and less than 10 $\}$

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9. State whether the sets are finite or infinite.

$\{x \in \mathbb{N}$: x is a rational number $\}$

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10. State whether the sets are finite or infinite.

$\{x \in \mathbb{N}$: x is a rational number $\}$

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11. By taking suitable sets A, B, C, verify the results :

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

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12. By taking suitable sets A, B, C, verify the results :

$A \times (B \cup C) = (A \times B) \cup (A \times C)$

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13. By taking suitable sets A, B, C, verify the results :

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

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14. By taking suitable sets A, B, C, verify the results :

C-(B-A) = $(C \cap A) \cup (C \cap B)$

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15. By taking suitable sets A, B, C, verify the results :

(B-A) $\cap C = (B \cap C) - A = B \cap (C - A)$

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16. By taking suitable sets A, B, C, verify the results :

(B-A) $\cup C = (B \cup C) - (A - C)$

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17. Justify the trueness of the statement " An element of a set can never be a subset of itself ".

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18. If $n(p(A)) = 1024$, $n(A \cup B) = 15$ and $n(P(B)) = 32$, then find $n(A \cap B)$.

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19. If $n(A \cap B) = 3$ and $n(A \cup B) = 10$ then find $n(P(A \triangle B))$

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20. For a set A, $A \times A$ contains 16 elements and two of its elements are (1,3) and (0,2). Find the elements of A.

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21. Let A and B be two sets such that n (A) = 3 and n(B) =2. If (x,1) (y,2) (z,1) are in $A \times B$, find A and B, where x,y,z are distinct elements.

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22. If $A \times A$ has 16 elements, S = {(a,b) $\in A \times A : a < b\}$, (-1,2) and (0,1) are two elements of S, then find the remaining elements of S.

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Exercise 1 2

1. Discuss the relations for reflexivity, symmetricity and transitivity :

The relation R defined on the set of all positive integers by " m Rn if m divides n".

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2. Discuss the relations for reflexivity, symmetricity and transitivity :

Let P denote the set of all straight lines in a plane. The relation R defined by " lRm if I is perpendicular to m ".

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3. Discuss the relations for reflexivity, symmetricity and transitivity :

Let A be the set consisting of all the members of a family. The relation R defined by " aRb if a is not a sister of b"

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4. Discuss the relations for reflexivity, symmetricity and transitivity :

Let A be the set consisting of all the female members of a family. The relation R defined by " aRb if a is not a sister of b".

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5. Discuss the relations for reflexivity, symmetricity and transitivity :

On the set of natural numbers the relation R defined by " xRy if x + 2y = 1 ".

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6. Let X = {a, b,c,d}, and R = { (a,a) (b,b) (a,c)}. Write down the minimum number of ordered pairs to be included to R to make it

(i) reflexive (ii) symmetric

(iii) transitive (iv) equivalence.

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7. Let A = { a,b,c }, and R = {(a,a) (b,b) (a,c) }. Write down the minimum number of ordered pairs to be included to R to make it

(i) reflexive (ii) symmetric

(iii) transitive (iv) equivalence.

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8. Let P be the set of all triangles in a plane and R be the relation defined on P as a Rb if a is similar to b. Prove that R is an equivalence relation .

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9. On the set of natural number let R be the relation defined by aRb if 2a +3b=30. Write down the relation by listing all the pair . check whether it is

(i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

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10. Prove that the relation " friendship " is not an equivalence relation on the set of all people in Chennai.

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11. On the set of natural number let R be the relation defined by aRb if a+b ≤ 6. Write down the relation by listing all the pairs. Check whether it is

(i) reflexive (ii) symmetric

(iii) transitive (iv) equivalence.

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12. Let A = {a,b,c }. What is the equivalence relation of smallest cardinality on A ? What is the equivalence relation of largest

cardinality on A?

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13. In the set Z of integers, define mRn if m-n is divisible by 7. Prove that R is an equivalence relation.

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Exercise 1 3

1. Suppose that 120 students are studying in 4 sections of eleventh standard in a school. Let A denotes the set of students and B denote the set of the sections. Define a relation from A to B as "x related to y if the student x belongs to the section y". Is this relation a function ? What can you say about the inverse relation ? Explain your answer.

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2. Write the values of f at -4,1,-2,7,0 if f(x)=

$$\begin{cases} -x+4 & \text{if} \quad -\infty < x \leq -3 \\ x+4 & \text{if} \quad -3 < x < -2 \\ x^2 - x & \text{if} \quad -2 \leq x < 1 \\ x - x^2 & \text{if} \quad 1 \leq x < 7 \\ 0 & \text{otherwise} \end{cases}$$

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3. Write the values of f at -3,5,2,-1,0 if f(x)=

$$\begin{cases} x^2 + x - 5 & \text{if} \quad x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if} \quad x \in (3, \infty) \\ x^2 & \text{if} \quad x \in (0, 2) \\ x^2 - 3 & \text{otherwise} \end{cases}$$

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4. State whether the following relations are functions or not. If it is a function check for one- to- oneness and ontoness. If it is not a function state why?

If A= {a,b,c} and f= {(a,c) (b,c) (c,b)}: (f:A $\rightarrow$ A).

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5. State whether the following relations are functions or not. If it is a function check for one- to- oneness and ontoness. If it is not a function state why?

If X = { x,y,z } and f= {(x,y) (x,z) (z,x) } : (f: X $\rightarrow$ X)

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6. Let A ={ 1,2,3,4,} and B = { a,b,c,d }. Give a function from A $\rightarrow$ B for each of the :

neither one -to -one and nor onto.

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7. Let A ={ 1,2,3,4,} and B = { a,b,c,d }. Give a function from A $\rightarrow$ B for each of the :

not one-to -one but onto.

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8. Let A ={ 1,2,3,4,} and B = { a,b,c,d }. Give a function from A $\rightarrow$ B for each of the :

one-to-one but not onto.

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9. Let A ={ 1,2,3,4,} and B = { a,b,c,d }. Give a function from A $\rightarrow$ B for each of the :

one -to -one and onto.

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10. Find the domain of $\frac{1}{1-2\sin x}$.

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11. Find the largest possible domain of the real valued function f(x) = $\frac{\sqrt{4-x^2}}{\sqrt{x^2-9}}$.

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12. Find the range of the function $\frac{1}{2\cos x - 1}$.

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13. Show that the relation xy = -2 is a function for a suitable domain. Find the domain and the range of the function.

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14. If f,g : $\mathbb{R} \to \mathbb{R}$ are defined by f(x) = |x| +x and g(x) = |x|-x, find g o f and f o g.

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15. If f,g,h are real valued function defined on R, then prove that (f+g)oh=foh+goh. what can you say about fo(g+h)? Justify your answer.

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16. If : $\mathbb{R} \to \mathbb{R}$ is defined by f(x) = 3x-5, prove that f is a bijection and find its inverse.

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17. The weight of the muscles of a man is a function of his body weight x and can be expressed as W(x) = 0.35x. Determine the domain of this

function.

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18. The distance of an object falling is a function of time t and can be expressed as s(t) = $-16t^2$. Graph the function and determine if it is one-to-one.

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19. The total cost of airfare on a given route is comprised of the base cost C and the fuel surcharge S in rupee. Both C and S are functions of the mileage m, C(m) =0.4 m +50 and S(m) = 0.03 m. Determine a function for the total cost of a ticket in terms of the mileage and find the airfare for flying 1600 miles.

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20. A salesperson whose annual earnings can be represented by the function A (x) = 30,000+0.04x, where x is the rupee value of the merchandise he sells. His son is also in sales and his earnings are represented by the function S(x) = 25,000 +0.05 x. Find (A+S) (x) and determine the total family income if they each sell Rs 1,50,00,000 worth of merchandise.

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21. The function for exchanging American dollars for Singapore Dollar on a given day is f(x) = 1.23 x, where x represents the number of American dollars. On the same day the function for exchanging Singapore Dollar to Indian Rupee is g(y) = 50.50 y , where y represents the number of Singapore dollars. Write a function which will give the exchange rate of American dollars in terms of Indian rupee.

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22. The owner of a small restaurant can prepare a particular meal at a cost of Rupees 100. He extimate that if the menu price of the meal is x rupees, then the number of customers who will order that meal at that price in an evening is given by the function D (x) = 200 - x. Express his day revenue total cost and profit on this meal as a function of x.

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23. The formula for converting from Fahrenheit to Celsius temperatures is y = $\frac{5x}{9} - \frac{160}{9}$. Find the inverse of this function and determine whether the inverse is also a function.

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24. A simple ciphertakes a number and codes it, using the function f(x) = 3x -4. Find the inverse of this function, determine whether the inverse

is also a function and verify the symmetrical property about the line y = x (by drawing the lines).

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Exercise 1 4

1. For the curve y = x^3 given in figure draw,

y = -x^3

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2. For the curve y = x^3 given in figure draw,

y = $x^3 + 1$

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3. For the curve y = x^3 given in figure drawy=$x^3 - 1$

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4. For the curve y = x^3 given in figure draw, y=$(x + 1)^3$

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5. For the curve , $y = x^{\frac{1}{3}}$ given in figure draw.

$y = -x^{\left(\frac{1}{3}\right)}$

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6. For the curve , $y = x^{\frac{1}{3}}$ given in figure draw.

$y = x^{\left(\frac{1}{3}\right)} + 1$

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7. For the curve , $y = x^{\frac{1}{3}}$ given in figure draw.

$y = x^{\left(\frac{1}{3}\right)} - 1$

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8. For the curve , $y = x^{\frac{1}{3}}$ given in figure draw.

$(x+1)^{\left(\frac{1}{3}\right)}$

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9. Graph the functions f (x) = x^3 and g(x) = $\sqrt[3]{x}$ on the same co-ordinate plane. Find fog and graph it on the plane as well. Explain your results.

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10. Write the steps to obtain graph of steps to obtain the graph of the function y = 3 $(x-1)^2$+5 from the graph y = x^2.

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11. From the curve y=sin x, graph the functions.

y=sin (-x)

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12. From the curve y=sin x, graph the functions.

y= -sin (-x),

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13. From the curve y=sin x, graph the functions.

y=$\sin\left(\frac{\pi}{2}+x\right)$ which is cos x.

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14. From the curve y=sin x, graph the functions.

y= $\sin\left(\frac{\pi}{2} - x\right)$ which is also cos x.

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15. From the curve y=x, draw

y=-x

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16. From the curve y=x, draw

y=2x

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17. From the curve y=x, draw

y=x+1

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18. From the curve y=x, draw

$y=\frac{1}{2}x+1$

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19. From the curve y=x, draw

2x+y+3=0.

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20. From the curve y= |x|, draw

y = |x-1|+1

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21. From the curve y= |x|, draw

y= |x+1|-1

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22. From the curve y= |x|, draw

y = |x+2|-3.

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23. From the curve y = sin x draw y = sin |x| (Hint : sin (-x) = -sin x.)

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Exercise 1 5

1. If A= {(x,y) : y = e^x, $x \in R$} and B = { (x,y) : y = e^{-x}, $x \in$ R } then n (A $\cap$ B) is

A. Infinity

B. 0

C. 1

D. 2

Answer: A

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2. If A = { (x,y) : y = sin x, x $\in$ R } and B = { (x,y) : y = cos x, x $\in$ R} then A $\cap$ B contains

A. no element

B. infinitely many elements

C. only one element

D. cannot be determined.

Answer: A

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3. The relation R defined on a set A = { 0,-1,1,2} by xRy if $|x^2 + y^2| \leq 2$, then which one of the following is true?

A. R= {(0,0),(0,-1),(0,1),(-1,0), (-1,1),(1,2),(1,0)}

B. $R^{-1} =$ {(0,0),(0,-1),(0,1),(-1,0), (1,0)}

C. Domain of R is { 0,-1,1,2 }

D. Range of R is { 0,-1,1}

Answer: A

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4. If f(x) = |x-2|+|x+2|,x $\in$ R, then

A. $f(x) = \begin{cases} -2x & \text{if} \quad x \in (-\infty, -2] \\ 4 & \text{if} \quad x \in (-2, 2] \\ 2x & \text{if} \quad x \in (2, \infty) \end{cases}$

B. $f(x) = \begin{cases} 2x & \text{if} \quad x \in (-\infty, -2] \\ 4 & \text{if} \quad x \in (-2, 2] \\ -2x & \text{if} \quad x \in (2, \infty) \end{cases}$

C. $f(x) = \begin{cases} -2x & \text{if} \quad x \in (-\infty, -2] \\ -4 & \text{if} \quad x \in (-2, 2] \\ 2x & \text{if} \quad x \in (2, \infty) \end{cases}$

D. $f(x) = \begin{cases} -2x & \text{if} \quad x \in (-\infty, -2] \\ 2 & \text{if} \quad x \in (-2, 2] \\ 2x & \text{if} \quad x \in (2, \infty) \end{cases}$

Answer: B::D

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5. Let $\mathbb{R}$ be the set of all real numbers. Consider the following subsets of the plane $\mathbb{R} \times \mathbb{R}$:S = { (x,y) : y=x+1 and $0 < x < 2$} and T = { (x,y) : x-y is an integer }. Then which of the following is true ?

A. T is an equivalence relation but S is not an equivalence relation.

B. Neither S nor T is an equivalence relation

C. Both S and T are equivalence relation

D. S is an equivalence relation but T is not an equivalence relation.

Answer: A::B::C

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6. Let A and B be subsets of the universal set $\mathbb{N}$, the set of natural numbers. Then A' $\cup [(A \cap B) \cup B']$ is

A. A

B. A'

C. B

D. $\mathbb{N}$

Answer:

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7. The number of students who take both the subjects Mathematics and Chemistry is 70. This represent 10 % of the enrollment in Mathematics and 14% of the enrollment in Chemistry. The number of students take at least one of these two subjects, is

A. 1120

B. 1130

C. 1100

D. insufficient data

Answer: A::C

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8. If n $((A \times B) \cap (A \times C)) = 8 \text{and} n(B \cup C) = 2,$ then n (A) is

A. 6

B. 4

C. 8

D. 16

Answer: D

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9. If n (A) = 2 and n $(B \cup C)$ =3 then n $[(A \times B) \cup (A \times C)]$ is

A. 2^3

B. 3^2

C. 6

D. 5

Answer:

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10. If two sets A and B have 17 elements in common, then the number of elements common to the set $A \times B$ and $B \times A$ is

A. 2^{17}

B. 17^2

C. 34

D. insufficient data

Answer: A::B

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11. For non-empty sets A and B, if A $\subset B$then$(A \times B) \cap (B \times A)$ is equal to

A. $A \cap B$

B. $A \times A$

C. $B \times B$

D. none of these.

Answer: A

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12. The number of relations on a set containing 3 elements is

A. 9

B. 81

C. 512

D. 1024

Answer: C

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13. Let R be the universal relation on a set X with more than one element. Then R is

A. not reflexive

B. not symmetric

C. transitive

D. none of these.

Answer: A

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14. Let X = { 1,2,3,4 } and R = { (1,1), (1,2),(1,3),(2,2), (3,3),(2,1),(3,1),(1,4),(4,1)}.

Then R is

A. reflexive

B. symmetric

C. transitive

D. equivalence

Answer: C

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15. The range of the function $\frac{1}{1-2\sin x}$ is

A. $(-\infty, -1) \cup \left(\frac{1}{3}, \infty\right)$

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

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

D. $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$

Answer: A::C

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16. The range of the function f(x) = $|\lfloor x \rfloor - x|$, $x \in \mathbb{R}$ is

A. [0,1]

B. $[0, \infty)$

C. [0,1)

D. (0,1)

Answer: A

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17. The rule f(x) = x^2 is a bijection if the domain and the co-domain are given by

A. $\mathbb{R}, \mathbb{R}$

B. $\mathbb{R}, (0, \infty)$

C. $(0, \infty), \mathbb{R}$

D. $[0, \infty), [0, \infty)$

Answer:

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18. The number of relations form a set containing melements to a set containing n elements is

A. mn

B. m

C. n

D. m+n

Answer:

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19. The function f : $[0,2\pi] \to 1$ [-1,1] defined by f(x) = sin x is

A. one-to -one

B. onto

C. bijection

D. cannot be defined

Answer:

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20. If the function f : [-3,3] $\rightarrow$ S defined by f(x) = x^2 is onto, then S is

A. [-9,9]

B. $\mathbb{R}$

C. [-3,3]

D. [0,9]

Answer:

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21. Let X = { 1,2,3,4}, Y = {a,b,c,d} and f={(1,a), (4,b), (2,c),(3,d),(2,d)}. Then f is

A. an one-to-one function

B. an onto function

C. a function which is not one-to-one

D. not a function

Answer: D

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22. The inverse of f(x) = $\begin{cases} x & \text{if} \quad x < 1 \\ x^2 & \text{if} \quad 1 \leq x \leq 4 \\ 8\sqrt{x} & \text{if} \quad x > 4 \end{cases}$ is

A. $f^{-1}(x) = \begin{cases} x & \text{if} \quad x < 1 \\ \sqrt{x} & \text{if} \quad 1 \leq x \leq 16 \\ \frac{x^2}{64} & \text{if} \quad x > 16 \end{cases}$

B. $f^{-1}(x) = \begin{cases} -x & \text{if} \quad x < 1 \\ \sqrt{x} & \text{if} \quad 1 \leq x \leq 16 \\ \frac{x^2}{64} & \text{if} \quad x > 16 \end{cases}$

C. $f^{-1}(x) = \begin{cases} x^2 & \text{if} \quad x < 1 \\ \sqrt{x} & \text{if} \quad 1 \leq x \leq 16 \\ \frac{x^2}{64} & \text{if} \quad x > 16 \end{cases}$

D. $f^{-1}(x) = \begin{cases} 2x & \text{if} \quad x < 1 \\ \sqrt{x} & \text{if} \quad 1 \leq x \leq 16 \\ \frac{x^2}{8} & \text{if} \quad x > 16 \end{cases}$

Answer: A::B::D

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23. Let f: $\mathbb{R} \to \mathbb{R}$ be defined by f(x)=1 -|x|. Then the range of f is

A. $\mathbb{R}$

B. $(1, \infty)$

C. $(-1, \infty)$

D. $(-\infty, 1)$

Answer: D

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24. The function f : $\mathbb{R} \to \mathbb{R}$ is defined by f(x) = sin x + cos x is

A. an odd function

B. neither an odd function nor an even function

C. an even function

D. both odd function and even function.

Answer: A::C::D

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25. The function f : $\mathbb{R} \to \mathbb{R}$ is defined by f(x) = $\frac{(x^2 + \cos x)(1 + x^4)}{(x - \sin x)(2x - x^3)} + e^{-|x|}$ is

A. an odd function

B. neither an odd function nor an even function

C. an even function

D. both odd function and even function.

Answer: A::C

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Additional Problems Section A

1. Let f : R $\rightarrow$ R be defined as f(x) = x^4. Choose the correct answer.

A. f is one -one onto (2) f is onto

B. f is onto

C. f is one - one but not onto

D. f is neither one -one nor onto

Answer:

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2. Let f : R $\rightarrow$ R to given by f(x) = $\left(3 - x^3\right)^{\frac{1}{3}}$. Then of (x) is

A. $x^{\frac{1}{a}}$

B. x^a

C. x

D. $3 - x^a$

Answer:

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3. Let A = {-2,-1,0,1,2} and f:A $\rightarrow$ Z be given by f(x) = $x^2 - 2x - 3$ then preimage of 5 is

A. -2

B. -1

C. 0

D. 1

Answer: B

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4. Which one of the following is a finite set ?

A. $\{x : x \in \mathbb{Z}, x < 5\}$

B. $\{x : x \in WW, x \geq 5\}$

C. $\{x : x \in \mathbb{N}, x > 5\}$

D. {x:x is an even prime number }

Answer: A::B

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5. If $\subseteq$ B, then A\B is

A. B

B. A

C. $\emptyset$

D. $\frac{B}{A}$

Answer:

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6. Given A = {5,6,7,8}. Which one of the following is incorrect?

A. $\emptyset \subseteq A$

B. $A \subseteq A$

C. { 7,8,9} $\subseteq$ A

D. {5} $\subseteq$ A

Answer: A::B

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7. The shaded region in the adjoining diagram represents.

A. A\B

B. B\A

C. $A \Delta B$

D. A'

Answer: A::B::D

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8. The shaded region in the adjoining diagram represents.

A. A\B

B. A'

C. B'

D. B\A

Answer: A::B

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9. Let R be a relation on the set $\mathbb{N}$ given by `RR= {(a,b) : a=b-2,b gt6}. Then

A. (2,4) $\in$ R

B. (3,8) $\in$ R

C. $(6, 8) \in$ R

D. $(8, 7) \in$ R

Answer:

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10. If A = {1,2,3} , B = {1,4,6,9} and R is a relation from A to B defined by "x is greater than y ". The range of R is

A. {1,4,6,9}

B. {4,6,9}

C. {1}

D. none of these.

Answer: A

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11. For real numbers x and y define $x\ R\ y$ if $x - y + \sqrt{2}$ is an irrational number. Then the relation R is

A. reflexive

B. symmetric

C. transitive

D. none of these.

Answer:

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12. Let R be the relation over the set of all straight lines in a plane such that $l_1 R l_2 \Leftrightarrow l_1 \perp l_2$. Then R is

A. symmetric

B. reflexive

C. transitive

D. an equivalence relation

Answer: C

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13. Which of the following is not an equivalence relation on z?

A. aRb $\Leftrightarrow a + b$ is an even integer

B. aRb <=> a-b is an even integer

C. $aRb \Leftrightarrow a < b$

D. $aRb \Leftrightarrow a = b$

Answer: A::B

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14. Which of the following functions from z to itself are bijections (one-one and onto)?

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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15. Let f : Z $\rightarrow$ Z be given by f(x) = $\begin{cases} \frac{x}{2} & \text{if is even} \\ 0 & \text{if is odd} \end{cases}$ Then f is

A. one-one but not onto

B. onto but not one -one

C. one-one and onto

D. neither one-one nor onto

Answer: B

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

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

B. $\frac{x+5}{3}$

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

D. does not exists since f is not onto

Answer: C

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17. If f (x) = 2x-3 and g(x)= $x^2 + x - 2$ then go f(x) is

A. $2\left(2x^2 - 5x + 2\right)$

B. $\left(2x^2 - 5x - 2\right)$

C. $2\left(2x^2 + 5x + 2\right)$

D. $\left(2x^2 + 5x - 2\right)$

Answer: B

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18. Let f : $\mathbb{R} \to \mathbb{R}$ be given by f(x) = x+ $\sqrt{x^2}$ is

A. injective

B. surjective

C. bijective

D. none of these.

Answer:

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19. Choose the correct statement .

A. One-to-one function have inverse

B. Onto function have inverse

C. bijection function have inverse

D. many - to -one function hae inverse

Answer: A::B::C

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20. Match List - I with List II

List I		List II	
i.	$\{(1,1)(2,2)(3,3)(1,2)\}$	(b)	equivalence
ii.	$\{(1,2)(2,1)(2,3)(3,2)\}$	(b)	transitive
iii.	$\{(1,1)(2,3)(1,3)\}$	(c)	Symmetric
iv.	$\{(1,1)(2,2)(3,3)(1,2)(2,1)(2,3)(1,3)\}$	(d)	reflexive

A. c d b a

B. d c b a

C. b a d c

D. b a b c

Answer: A::B::C::D

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Additional Problems Section B

1. If n $(A \cap B) = 3$ and n $(A \cup B) = 10$ then find n [P $(A \Delta B)$]

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2. In the set Z of integers, define m Rn if m-n is a multiple of 12. Prove that R is an equivalence relation.

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3. Draw the curves of (i) y = x^2 by using the graph of curve y = x

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4. Find the number of subsets of A if A = { X : X = 4n +1, 2 $\leq n \leq 5, n \in \mathbb{N}$ }

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5. Let f={(1,4),(2,5),(3,5)} and g={(4,1),(5,2),(6,4)}. Find gof Can you find fog?

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6. Define one to one function?

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7. If A = {1,2,3,4} and B = {3,4,5,6}, find n $((A \cup B) \times (A \cap B) \times (A \Delta B))$.

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8. Prove $A \times A$ has 9 elements, $S = \{(a, b) \in A \times A : a > b\}$, $(2, -1)$ and $(2, 1)$ are two elements. , then find the remaining elements of S.

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Additional Problems Section C

1. Draw the graph of the functions f (x) = |x|, f(x) = |x-1| and f(x) = $(x-1)^2$

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2. If f : R - (-1,1) $\rightarrow$ R is defined by f(x) = $\frac{x}{x^2-1}$, verify whether f is one to one.

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3. If A and B are two sets so that n(B-A) =2n (A-B) $= 4n(A \cap B)$ and if $n(A \cup B) = 14$, then find n(P(A)).

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4. If the function f and g are given by f = {(1,2), (3,5), (4,1) } g = {(2,3), (5,1), (1,3)} find range of f and g. Also write down fog.

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5. Find the pairs of equal sets, if any, give reasons:

$A = \{0\}, B = \{x : x > 15 \text{ and } x < 5\},$

$C = \{x : x - 5 = 0\}, D = \{x : x^2 = 25\},$

E = {x : x is an integral positive root of the equation $x^2 - 2x - 15 = 0$}.

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Additional Problems Section D Marks 5

1. A relation R is defined on the set z of integers as follows : (x,y) $\in \mathbb{R} \Leftrightarrow x^2 + y^2 = 25$. Express R and R^{-1} as the set of ordered pairs and hence find their respective domains.

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2. If f : $\mathbb{R} \to \mathbb{R}$ is defined by f (x) = 2x -3, then prove that f is a bijection and find its inverse.

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3. If the function f is defined as $f(x) = \begin{cases} 3x - 2 & x > 3 \\ x^3 - 2 & -2 \leq x \leq 2 \\ 2x + 1 & x < -2 \end{cases}$

Then find the values, if exists f (4), f (-4), f(0), f(-7).

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4. Let A = {0,1,2,3}. Construct relation on A of the following type.

not reflexive, not symmetric, not transitive

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5. Let A = {0,1,2,3}. Construct relation on A of the following type.

not reflexive, not symmetric, transitive

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6. Let A = {0,1,2,3}. Construct relation on A of the following type.

not reflexive, symmetric , not transitive

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7. Let A = {0,1,2,3}. Construct relation on A of the following type.

not reflexive, symmetric , transitive

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8. Let A = {0,1,2,3}. Construct relation on A of the following type.

reflexive, not symmetric, not transitive

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9. In a survey of 5000 persons in a town, it was found that 45% of the persons know Languages A, 25% know language, B, 10% know language C, 5% know languages A and B, 4% know languages B and C, and 4% know Language A and C. If 3% of the persons know and the three Languages, find the number of persons who knows only Languages A.

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10. Let f , g :$\mathbb{R} \to \mathbb{R}$ be defined as f(x) = 2x -|x| and g(x) = 2x+|x|. Find f(g).

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11. Let $A = \{2, 3, 5\}$ and relataion $R = \{(2, 5)\}$ write down the minimum number of ordered pairs to be indluded to R to make it an equivalence relation.

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