MATHS

BOOKS - CENGAGE

RELATIONS AND FUNCTIONS

Test Yourself Level 1

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1. Write the set in the roster form :

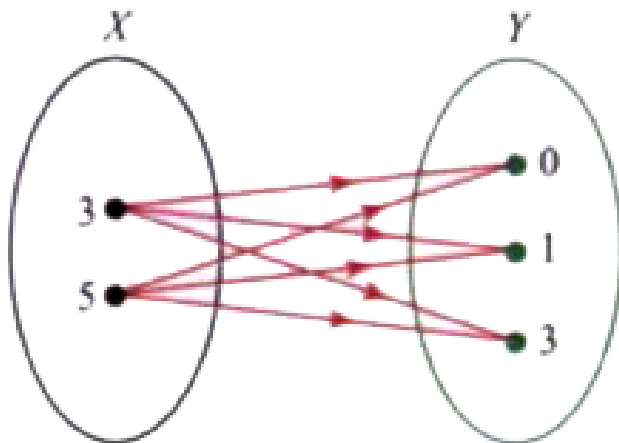$\{(x, y) \mid x \in N, y \in N, x + 2y = 7\}$.

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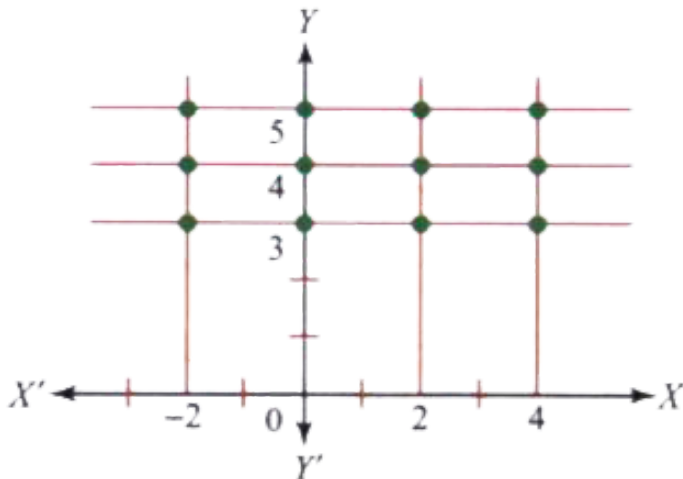
2. If $A = \{-2, -1, 0\}, B = \{-1, 1, 2\}$ and $C = \{x \mid x^2 - 3x + 2 = 0\}$, verify $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

3. Write the Cartesian product $X \times Y$ for the following diagram.

4. Write the Cartesian product $X \times Y$ for the following diagram .

5. Let $R = \{(x, y) \mid 2x + 3y < 10, x \in N, y \in N\}$ be a relation on N.

Write the relation in the roster form.

6. Let $A = \{-2, -1, 0, 1\}$, $B = \{1, 2, 3, 4\}$, and f be a subset of

$A \times B$ given by $f = \{(x, y) \mid x + y = 1\}$. Is f a function from A to B ? If

not, remove minimum number of element from the set a so that f may be a function from the new set to B.

7. Let $A = \{1, 3, 5\}$ and $B = \{2, 6, 10, 12\}$. A function f from A to B defined by the value - table form :

x	1	3	5
y	2	6	10

Write the function in the roster form.

8. Let $A = \{1, 3, 5\}$ and $B = \{2, 6, 10, 12\}$. A function f from A to B defined by the value - table form :

x	1	3	5
y	2	6	10

Write its range and image of 5.

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9. Let $A = \{1, 3, 5\}$ and $B = \{2, 6, 10, 12\}$. A function f from A to B defined by the value - table form :

x	1	3	5
y	2	6	10

What type of function is f ?

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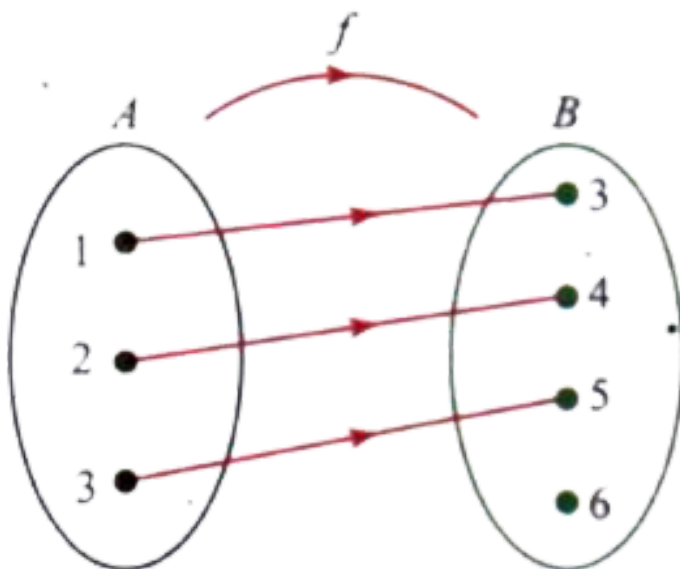
10. If $f(x) = \dfrac{x}{x^2 - 1}, x \neq 1 - 1$, find f(2)

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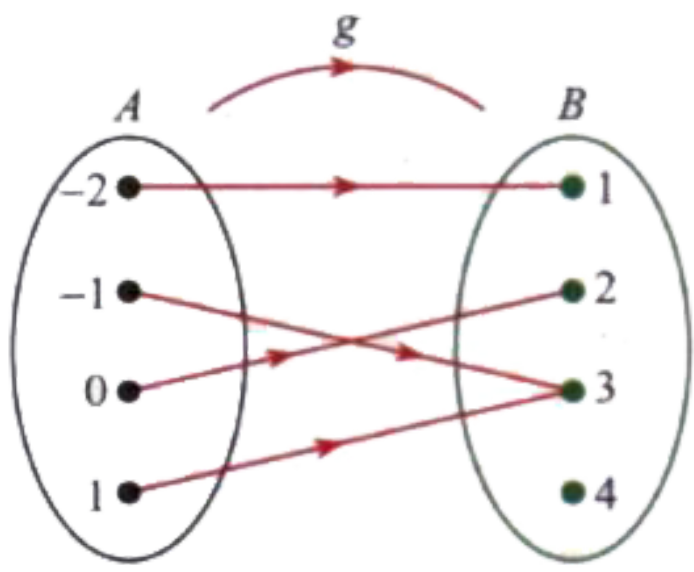**11.** If $f(x) = \dfrac{x}{x^2 - 1}, x \neq 1 - 1$, find $f\left(-\dfrac{1}{2}\right)$

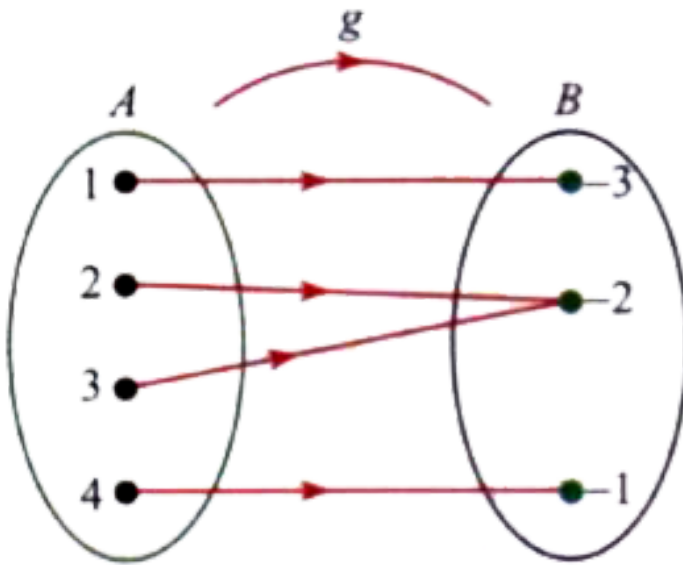**12.** A function $f: A \rightarrow B$ is defined by following diagram. Classify the funtion.

13. A function $f: A \rightarrow B$ is defined by the following diagram. Classify the function

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14. A function $f: A \rightarrow B$ is defined by following diagram. Classify the funtion.

15. The Cartesian product $A \times B$ of two sets has six element of which five are given below: (2,a)(3,b),(2,b),(3,a), and (3,c). Find the sixth ordered pair, and the sets A and B.

Test Yourself Level 2

1. Let $R = \{(x, y) \mid x > y, x \in P, y \in Q\}$, where $P = \{1, 3, 5\}$ and $Q = \{2, 4\}$. List the elements of the relation R from the set P to set Q and also write the domain and range of the relation.

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2. A function f is given by $f(x) = 25 - 4x^2$. Find f(3)

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3. A function f is given by $f(x) = 25 - 4x^2$. Find x scuh that f(x)=0

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4. If $A = \{-2, -1, 0, 1, 2\}$ and $B = \{-3, -1, 1, 5\}$, list all the elements of the following set :

$S = \{(x, y) \mid y = 2x^2 - 3, x \in A, y \in B\}$. Is S a function from A to B ? If so, find its range and classify it.

5. The Cartesian product $A \times B$ has nine members of which three are (2,7),(4,8) and (5,9). Find the sets (a) A, (b) B and (c) $A \times B$

6. Let $' < '$ be the relation of 'less than' in the set R of real numbers. Is the relation (a) reflexive, (b) symmetric, or (c) transitive ? Juntify your answer.

7. Given : $A = \{a, b, c, d\}$ and $B = \{1, 2, 3, 4\}$.

Form ordered pairs showing a one - one function from A to B.

8. Given : $A = \{a, b, c, d\}$ and $B = \{1, 2, 3, 4\}$.

Form order pairs showing a many - one function from A to B.

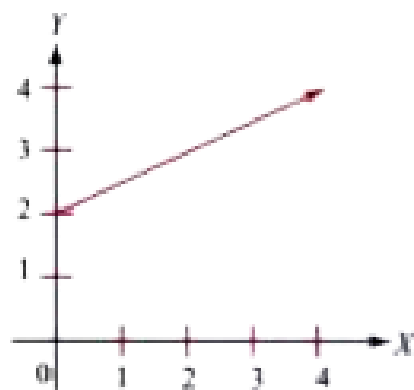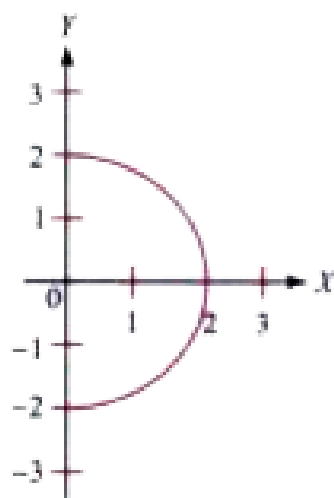**9.** The diagrams given below represent relations from X to Y. Classify them as relation or function. If the relation is a function, classify it as

one - one or many - one.

(a)

(b)

(c)
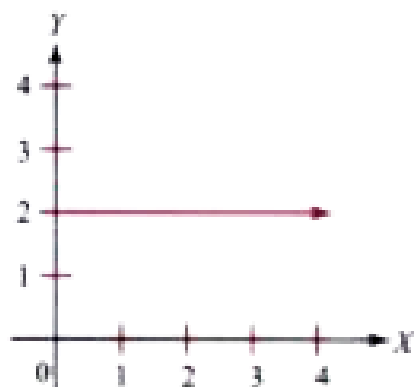
Test Yourself Level 3

1. On the set L of all lines on a plane, arelation, R is given by 'x R y' if and only if $'x \perp y'$ Is R (a) reflexive, (b) symmetric, or (c) transitive ?

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2. $A = \{1, 2, 3, 4, 5, 6\}$. Which of the following relations on A are (a) reflexive, (b) symmetric, or (c) transitive ?

$\{(x, y): x - y > 0\}$

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3. $A = \{1, 2, 3, 4, 5, 6\}$. Which of the following relations on A are (a) reflexive, (b) symmetric, or (c) transitive ?

$\{(x, y) : x \leq y\}$

4. $A = \{1, 2, 3, 4, 5, 6\}$. Which of the following relations on A are (a) reflexive, (b) symmetric, or (c) transitive ?

$\{(x, y) : x - y < 2\}$

5. $A = \{1, 2, 3, 4, 5, 6\}$. Which of the following relations on A are (a) reflexive, (b) symmetric, or (c) transitive ?

$\{(x, y) : x > y\}$

6. Which of the following are equivalence relations on $A = \{4, 6, 8\}$?

(A) $\{(4, 4), (6, 6), (8, 8), (4, 6), (6, 4)\}$

(B) $\{(4, 4), (6, 6), (8, 8), (5, 6)\}$

(C) $\{(4, 4), (6, 6), (8, 8), (4, 8), (8, 6)\}$

(D) $\{(4, 4), (6, 6), (8, 8), (4, 8), (8, 4)\}$

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7. A set of cones have a fixed height of 12 cm and varying radii, the maximum radius being 36 cm. Define the relation between the radius and the volume of cones. What are the comain and the range of the relation ? Is it a function ?

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8. Which of the following are functions ? If so, what type of function is it ?

P = set of people in Bangalore, Q = set of all surnames, and $f_1 = \{(x, y) : y$ is the surname of $x, x \in P, y \in Q\}$.

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9. Which of the following are functions ? If so, what type of function is it ?

G = set of measurements of length in cm,

H = set of measurements of area in cm^2, and

$f_2 = \{(x, y) : y$ is the area of a square of side x, $\ x \in G, y \in H\}$.

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10. Which of the following are functions ? If so, what type of function is it ?

P = set of parents, C = set of children, and

$f_3 = \{(x, y) : \ x$ is a parent of $\ y, x \in P, y \in C\}$.

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11. Which of the following are functions ? If so, what type of function is it ?

If $f: R \to R$ is given by $f(x) = x^3 - 1$, find x where $f(x) = 215$.

12. If $f: R \to R$ is given by $f(x) = x^2 - 1$, find x where $f(x) = 215$.

Test Yourself Level 3 Multiple Choice Questions

1. If $\left(a^2 + ab + b^2, b\right) = (8, 2)$ then (a,b) is given by

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

    B. $\left(-1 \pm \sqrt{5}, 2\right)$

    C. (2,3)

    D. none of these

Answer: B

2. If $A \times B = \phi$ then which of the following is necessarily true ?

A. $A = \phi$ or $B = \phi$

B. $A = \phi$ and $B = \phi$

C. Both (A) and (B)

D. None of these

Answer: A

3. If $A = \{1, 2\}$ and $B = \{3, 4\}$ then $A \times B =$

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

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

C. $A \times B = \{(3, 1), (3, 2), (4, 1), (4, 2)\}$

D. $A \times B = \{(1, 3), (1, 4), (2, 3), (2, 4)\}$

Answer: D

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4. A and B are two sets given in such a way that $(A \times B)$ contains elements. If three elements of $(A \times B)$ are (1,3),(2,5) and (3,3) then its remaining elements are

A. (1,1),(1,5) and (2,3)

B. (1,5),(2,3) and (3,5)

C. (1,5) (1,2) and (3,5)

D. (2,1), (2,3) and (3,5)

Answer: B

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5. If $A \times A$ has 9 elements two of which are (-1,0) and (0,1) then the set A is

A. $\{ - 1, 0\}$

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

C. $\{ - 1, 0, 1\}$

D. $\{0, 1\}$

Answer: C

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6. If $A \times A$ has 9 elements two of which are $(- 1, 0)$ and $(0, 1)$ the what are the other elements ?

A. $(- 1, - 1), (- 1, 1), (0, - 1), (0, 0), (1, - 1), (1, 2), (2, 1)$

B. $(- 1, - 2), (- 1, 1), (0, - 1), (0, 0), (0, 2), (0, 3), (0, 4)$

C. $(-1, -1), (0, -1), (1, 1), (0, 0), (1, 9), (9, 1), (9, 0)$
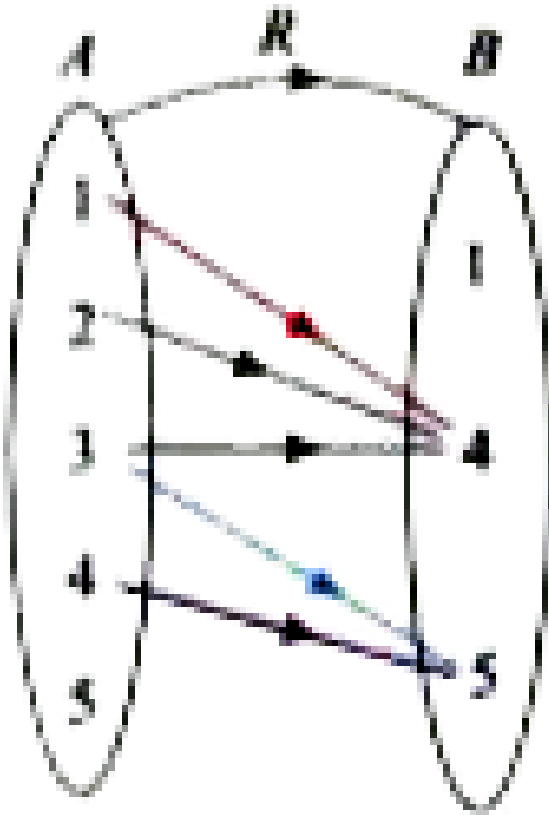
D. $(-1, -1), (-1, 0), (0, -1), (0, 0), (1, -1), (1, 0), (1, 1)$

Answer: D

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7. R' is a relation from a to B and the mapping is

then which of the following is correct ?

A. Domain of $R = \{1, 2, 3, 4, 5\}$

B. Range of $R = \{1, 4, 5\}$

C. Domain of $R = \{1, 2, 3, 4\}$

D. Range of $R = \{1, 4\}$

Answer: C

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8. Let $A = \{1, 3\}$ and $B = \{1, 2, 3, 4\}$. Then how many relations from A to B are possible ?

   A. 2^8

   B. 2^7

   C. 2^6

   D. 2^5

Answer: A

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9. Let N be the set of all natural numbers and let $R = \{(a, b) : a, b \in N$ and $2a + b = 10\}$, The domain and range of R

is

A. domain (R) = {1,2,3,4} and range = {2,4,6,8}

B. domain (R) = {1,2,3} and range = all natural numbers

C. domain (R)={1,2,34} and range = {2,4,6,8}

D. none of these

Answer: A

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10. Let $R = \{(x, x^3): \text{ x prime, } x < 8\}$. Which of the following is correct representation of R in roster form ?

A. $R = \{(3, 3^3), (5, 5^3), (7, 7^3)\}$

B. $R = \{(2, 2^3), (3, 3^3), (5, 5^3), (7, 7^3)\}$

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

D. $R = \{(1, 1^3), (2, 2^3), (3, 3^3), (5, 5^3), (7, 7^3)\}$

Answer: B

11. Let R be a relation on Z, defined as

$R = \{(1, b) : a, b \in Z \text{ and } a - b \in Z\}$. Then which of the following is correct about R ?

A. Symmetric, reflexive but not transitive

B. only reflexive

C. transitive but not symmetric

D. equivalence relation

Answer: D

12. If S is the set of all straight lines and relation R is defined on S as

$T = \{(S_1, S_2) : S_1$ is perpendicular to $S_2\}$ then R is

A. symmetric only

B. reflexive and symmetric only

C. transitive only

D. none of these

Answer: A

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13. If S is the set of all triangles lying in plane and relation R is defined on

S as :

$R = \{(S_1, S_2) : S_1$ is congruent to $S_2,$ where S_1 and S_2 belong to S$\}$

A. transitive

B. symmetric

C. reflexive

D. all of these

Answer: D

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14. If a function $f: R \to R$ is defined s $f(x) = 2x + 3a$ and $f(1) = 2f(2)$ then what is the value of a ?

A. -1

B. -2

C. 1

D. 2

Answer: B

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15. Let $f = \{(-1, -3), (0, -1), (1, 1), (2, 3)\}$ be a linear function from Z to Z. Then f(x) can be defined as

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

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

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

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

Answer: C

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

A. $\dfrac{2}{3}$
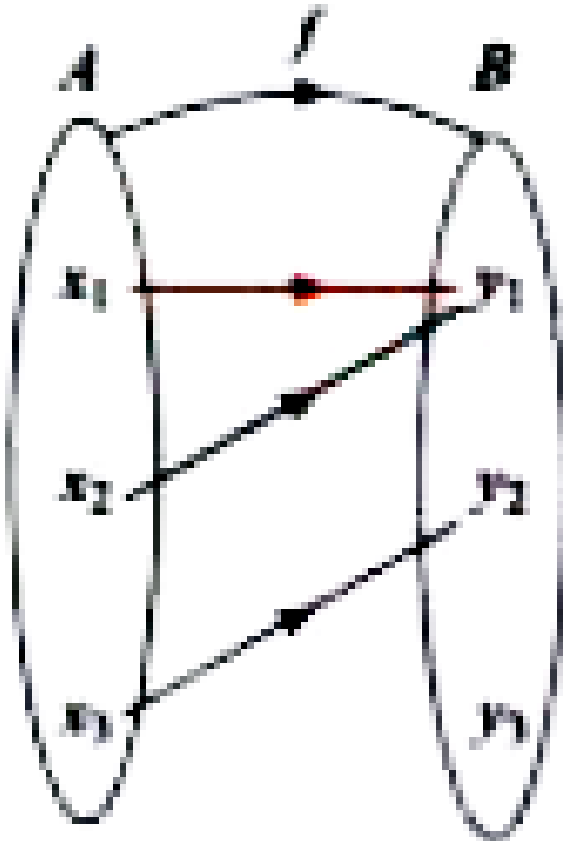
B. $\dfrac{3}{2}$

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

D. $\dfrac{4}{9}$

Answer: D

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17. A function $f: A \to B$ is defined as :

Which of the following is true ?

A. one - one function

B. one-one and onto function

C. many - one and into function

D. many-one and onto function

Answer: C

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18. Which of the following are equivalence relations on $A = \{4, 6, 8\}$?

A. $\{(4, 4), (6, 6), (8, 8), (4, 6), (6, 8)\}$

B. $\{(4, 4), (6, 6), (8, 8), (4, 6), (4, 8)\}$

C. $\{(4, 4), (6, 6), (8, 8), (4, 8), (4, 6)\}$

D. $\{(4, 4), (6, 6), (8, 8), (4, 8), (8, 4)\}$

Answer: D

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19. If $f(x) = x^3$ then what is the value of $\dfrac{f(5) - f(1)}{(5 - 1)}$?

A. 30

B. 31

C. 32

D. 33

Answer: B

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20. If $f(x) = \dfrac{x}{x - 1}$ the $\dfrac{f(a)}{f(a + 1)} =$

A. $f(-a)$

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

C. $f\left(a^2\right)$

D. $f\left(\dfrac{-a}{a-1}\right)$

Answer: C

21. If $y = f(x) = \dfrac{ax + b}{cx - a}$ then x is equal to

A. $1/f(x)$

B. $1/f(y)$

C. $yf(x)$

D. $xf(y)$

Answer: D

22. If the domain of function $f(x) = x^2 - 6x + 7$ is $(-\infty, \infty)$, then the range of function is

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

B. $[-2, \infty)$

C. $(-2, 3)$

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

Answer: B

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23. The domain of the function $f(x) = \log_{3+x}(x^2 - 1)$ is

A. $(-3, -1) \cup (1, \infty)$

B. $[-3, -1) \cup [1, \infty)$

C. $(-3, -2) \cup (-2, -1) \cup (1, \infty)$

D. $[-3, -2) \cup (-2, -1) \cup [1, \infty)$

Answer: C

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24. The domain of the function $f(x) = \sqrt{x - x^2} + \sqrt{4 + x} + \sqrt{4 - x}$ is

A. $[-4, \infty)$

B. $[-4, 4]$

C. $[0, 4]$

D. $[0, 1]$

Answer: D

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25. The largest possible set of real numbers which can be the domain

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

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

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

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

D. $(-\infty, 0) \cup (1, \infty)$

Answer: D

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26. If $f(x) = \log_a x$ and $F(x) = a^x$, then $F[f(x)]$ is

A. $f[F(x)]$

B. $f[F(2x)]$

C. $F|f(2x)|$

D. $F[(x)]$

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27. Let two function f(x) and g(i) are defined on $R \to T$ such that

$$f(x) = \begin{cases} x^2, & \text{x is irrational} \\ 2 - x^2, & \text{x is rational} \end{cases} \quad \text{and}$$

$$g(x) = \begin{cases} 2 - x^2, & \text{x is irrational} \\ x^2, & \text{x is rational} \end{cases}. \text{Then the function } f + g \colon R \to R \text{ is}$$

A. injective as well as surjective

B. injective but not surjective.

C. surjective but not injective.

D. neither surjective nor injective

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28. Range of the function $f(x) = \dfrac{x^2}{x^2 + 1}$ is

A. $(-1, 0)$

B. $(-1, 1)$

C. $[0, 1)$

D. $(1, 1)$

Answer: C

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29. The domain of the function $f(x) = \log\left(\sqrt{x - 4} + \sqrt{6 - x}\right)$ is

A. $[4, \infty)$

B. $(-\infty, 6]$

C. $[4, 6]$

D. none of these

Answer: C

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