MATHS

BOOKS - MTG WBJEE MATHS (HINGLISH)

SETS , RELATIONS AND FUNCTIONS

We Jee Workout Single Option Correct Type

1. 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. { l ,0 , - l }

D. None of these

Answer: B

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2. Let A be a relation on the set of all lines in a plane defined by $(l_2, l_2) \in$ R such that $l_1 \mid\mid l_2$, the n R is

A. reflexive only

B. symmetric only

C. transitive only

D. an equivalence relation

Answer: D

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3. If A = {7, 8, 9} and B = {9, 5}, then (A $\cup$ B) x (A $\cap$ B) is

A. {(7, 9), (7, 5), (8, 9), (8, 5), (9, 9), (9, 5)}

B. {(5, 9), (7, 9), (8, 9), (9, 9)}

C. {(9, 5), (9, 7), (9, 8), (9, 9)}

D. None of these

Answer: B

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4. Let f: $[-3, 3] \to R$ where f(x)=$x^3 + \sin x + \left[\frac{x^2+2}{a}\right]$ be an odd function then value of a is where [.] represents greatest integer functions

A. less than 11

B. 11

C. greater than 11

D. None of these

Answer: C

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5. The function y=$\frac{x}{1+|x|x}$, $x \in R, y \in R$ is

A. One-one onto function

B. Onto but not one-one

C. One-one but not onto

D. None of these

Answer: C

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6. Let n(A) = n, then the number of all relations on A, is

A. 2^m

B. $2^m - 2$

C. $2m^2$

D. None of these

Answer: C

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7. Let A = {7, 8, 9, a, b, c} and B = {1, 2, 3, 4} then number of universal relation from the set A to set B and set B to set A are

A. 2^{12}

B. 2^4

C. 24

D. $2^6 \times 2^4$

Answer: C

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8. Let A = {a,b,c} and B = {4, 5}. Consider a relation R defined from set A to set B, then R can be equal to set

A. A

B. B

C. $A \times B$

D. $B \times A$

Answer: C

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9. If A is the relation "less than" from A = {1,2, 3,4, 6, 7} to B = {1, 4, 5}, then R^{-1} equals

A. {(4, 1), (5, 1), (2, 5), (1, 4), (1, 5)}

B. {(4, 1), (5, 1), (4, 2), (5, 2), (4, 3), (5, 3)}

C. {(4, 1), (5, 1), (4, 2), (5, 2), (4, 3), (5, 3), (5, 4)}

D. None of thes

Answer: C

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10. Let A = {7, 8, 9, 10} and R = {(8, 8), (9, 9), (10, 10), (7, 8)} be a relation on A, then R is

A. Transitive only

B. Reflexive only

C. Symmetric only

D. None of these

Answer: A

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11. If n(U) = 700, n(A) = 200, n(B) = 240, $n(A \cap B)$ = 100, then n(A' $\cup$ B') equals

A. 260

B. 560

C. 360

D. 600

Answer: D

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12. Find the domain of function $f(x) = (\log)_4\left[(\log)_5\left\{(\log)_3\left(18x - x^2 - 77\right\}\right]\right.$

A. $x \in (4, 5)$

B. $x \in (0, 10)$

C. x $\in$ (8,10)

D. none of these

Answer: C

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13. If A and B are two sets, then (A $\cup$ B')' $\cap$ (A' $\cup$ B)' is

A. null set

B. universal set

C. A

D. B

Answer: A

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14. If a relation R is defined from a set $A = \{2, 3, 4, 5\}$ to a set $B = \{3, 6, 7, 10\}$ as follows $(x, y) \in R \Leftrightarrow x$ divides y. Expression of R^{-1} is represented by

A. {(6, 2), (10, 2), (3,3)}

B. {(6,2), (3,3), (10, 5)}

C. {(6, 2), (10, 2), (3, 3), (6, 3), (10, 5)}

D. None of these

Answer: C

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15. A & B are subsets of universal set U such that n(U) = 800, n(A) = 300, n(B) = 400 & n(A $\cap$ B) = 100. The number of elements in the set $A^c \cap B^c$ is

A. 100

B. 200

C. 300

D. 400

Answer: B

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16. LetR be the relation on the seM = {1, 2, 3, 4} given by R = {(1,2), (2,2), (1,1), (4,4), (1,3), (3, 3), (3,2)}. Then

A. R is reflexive and symmetric but not transitive

B. R is reflexive and transitive but not symmetric

C. R is symmetric and transitive but not reflexive

D. R is an equivalence relation

Answer: B

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

A. reflexive only

B. symmetric only

C. transitive only

D. None of these

Answer: A

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18. Let $f(x) = \frac{\alpha x}{x+1}, x \neq -1$. Then, for what values of α is f[f(x)]=x?

A. $\sqrt{2}$

B. $-\sqrt{2}$

C. 1

D. -1

Answer: D

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19. A function f,R $\rightarrow$ 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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20. 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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21. The range of the function $f(x) = \frac{x-2}{2-x}$ is

A. R

B. R - {1}

C. {-1}

D. R - { - I}

Answer: C

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22. Three sets A,B,C are such that A= $B \cap C$ and B=C $\cup$ A then

A. $A \subset B$

B. $A \supset B$

C. A =B

D. $A \subset B$

Answer: C

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23. The mapping f : $N \to N$ given by $f(n) = 1 + n^2, n \in N$, where N is the set of natural numbers, is

A. One-one and onto

B. Onto but not one-one

C. One-one but not onto

D. Neither one-one nor onto

Answer: C

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24. A function f : $A \to B$, where $A = \{x : -1 \leq x \leq 1\}$ and $B = \{y : 1 \leq y \leq 2\}$ is defined by the rule $y = f(x) = 1 + x^2$. Which of the following statement is correct ?

A. f is injective but not surjective

B. f is surjective but not injective

C. f is both injective and surjective

D. f is neither injective nor surjective

Answer: B

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25. There are 100 students in a class. In the examination, 50 of them failed in Mathematics, 45 failed in Physics, 40 failed in Biology and 32 failed in exactly two of the three subjects. Only one student passed in all the subjects. Then, the number of students failing in all the three subjects is

A. 12

B. 4

C. 2

D. none of these

Answer: C

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26. Let R be the set of real numbers and the functions $f: R \to R$ and $g: R \to R$ be defined by $f(x) = x^2 + 2x - 3$ and $g(x) = x + 1$. Then the value of x for which $f(g(x)) = g(f(x))$ is

A. -1

B. 0

C. 1

D. 2

Answer: A

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27. The domain of the function $f(x) = \sqrt{\cos^{-1}\left(\frac{1-|x|}{2}\right)}$ is

A. $(-3, 3)$

B. $[-3, 3]$

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

D. $(- \in f < y, -3] \cup [3, \infty)$

Answer: B

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

A. odd

B. even

C. neither odd nor even

D. constant

Answer: B

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29. A mapping from N to N is defined as follows $F: N \to N$ given by f(n) $=(n+5)^2, n \in N$ (N is the set of natural numbers) then

A. f is not one one

B. f is onto only

C. f is both on one and onto

D. f is one one but not onto

Answer: D

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30. Let $f = \left\{\left(x, \frac{x^2}{1+x^2}\right) : x \in R\right\}$ be a function from R into R. Determine the rage of f.

A. [0, 1)

B. [0, 1]

C. [0,2)

D. None of these

Answer: A

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31. In a survey it is to be found that 70% of employees like bananas and 64% like apples. If x% like both bananas and apples, then

A. $x \geq 34$

B. $x \leq 64$

C. $34 \leq x \leq 64$

D. all of these

Answer: D

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32. If : R $\rightarrow$ R defined by $f(x) = x|x|$, then $f(x)$ is

A. one one but not on to

B. one one onto

C. onto but not one one

D. none of these

Answer: B

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33. The inverse of $f(x) = \dfrac{10^x - 10^{-x}}{10^x + 10^{-x}} =$

A. $\dfrac{1}{2}\dfrac{\log_{10}(1+x)}{1-x}$

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

C. $\dfrac{1}{2}\log_{10}(2x-1)$

D. $\dfrac{1}{4}\dfrac{\log_{10}(2x)}{2-x}$

Answer: A

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34. Given a relation R ={ 7,8),(8,3) on the set A= {3,7,8} the least number of ordered pairs which when added to R make it an equivalence relations is

A. 5

B. 6

C. 8

D. none of these

Answer: B

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35. Two functions are defined as

$$f(x)=\begin{cases} x+1 & \text{if} x \leq 1 \\ 2x+1 & \text{if} < x \leq 2 \end{cases}$$

$$g(x)=\begin{cases} x^2 & \text{if} -1 \leq x < 2 \\ x+2 & \text{if} 2 \leq x \leq 3 \end{cases}$$

A. $\begin{cases} x+1 & \text{if} |x| \leq 1 \\ 2x^2+1 & \text{if} < x \leq \sqrt{2} \end{cases}$

B. $\begin{cases} x+1 & \text{if} |x| \leq 1 \\ 2x^2+1 & \text{if} < x < \sqrt{2} \end{cases}$

C. $\begin{cases} x+1 & \text{if} |x| \leq 1 \\ 2x^2+1 & \text{if} < x \geq \sqrt{2} \end{cases}$

D. none of these

Answer: A

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36. Let f(x)=$\left[\frac{g(x)-g(-x)}{f(x)+f(-x)}\right]^m$ such that m =2n $\in$ N and f(-x) $\neq$ -f(x) then f(x) is

A. an odd function

B. an even fiinction

C. periodic function

D. None of these

Answer: B

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37. If $f(x)+2f(1-x)=x^2+5\forall$ real values x then $f(x)$ is given by

A. $x^2-5)$

B. 2

C. $\frac{(x-2)^2+3}{3}$

D. none of these

Answer: C

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38. Range of $f(x) = .^{16-x}C_{2x-1} + ^{20-3x}C_{4x-5}$

A. [1728,1474]

B. {0,728}

C. {728,1617}

D. none of these

Answer: C

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39. v37

A. $\left(2^{n-1}, \infty\right)$

B. $(2^n, \infty)$

C. $\left(2^{2n+1}, \infty\right)$

D. none of these

Answer: D

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40. The inverse of the functions $f(x) = \log_2\left(x + \sqrt{x^2+1}\right)$ is

A. $2^x + 2^{-x}$

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

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

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

Answer: D

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41. The range of the function $f(x) = 9^x - 3^x + 1$ is

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

B. $(-\infty, 0)$

C. $(0, \infty)$

D. $\left[\frac{3}{4}, \infty\right)$

Answer: D

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42. The domain of the function $f(x) = \log_2(\log_3(\log_4 x))$ is

A. $-\infty < x < 47$

B. $4 < x < \infty$

C. $-4 < x < \infty$

D. $-4 \leq x < \infty$

Answer: B

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43. Find the domain and the range of the real function/defined by $f(x) = |x - 1|$

A. $R[0, \infty)$

B. $R, (-\infty, 0)$

C. R,R

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

Answer: A

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44. $f: N \to N$ where $f(x) = x - (-1)^x$ then f is

A. one one and into

B. many one and into

C. one one and onto

D. many one and onto

Answer: C

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45. If $f(x) = \log_{e^2 x}\left(\frac{2\ln x + 2}{-x}\right)$ and $g(x) = \{x\}$ then range of $g(x)$ for existance of $f(g(x))$ is

A. $\left(0, \frac{2}{e}\right)$

B. $\left(0, \frac{1}{e}\right) - \left\{\frac{1}{e^2}\right\}$

C. $\left(0, \frac{3}{e}\right)$

D. none of these

Answer: B

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46. The inverse of the function $f(x) = \frac{e^x - 2e^{-x}}{e^x + 2e^{-x}} + 1$ is

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

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

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

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

Answer: C::D

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47. Let A={1,2,3,4,5} and B= {1,3,5,7,9} which of the following is are relation from A to B ?

A. R_1 = {(a, b) | b = 2 + a, $a \in A, b \in B$}

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: A::B::C

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48. The inverse of the function $y = \frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}}$ is/an

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

B. $\frac{1}{4}\log_e\left(\frac{1-x}{1+x}\right)$

C. $\frac{1}{4}\log_e\left(\frac{1+x}{1-x}\right)$

D. an odd function

Answer: C::D

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49. Let $f: R \to R$, $g: R \to R$ be two function given by $f(x) = 5x - 4$ and $g(x) = x^3 + 7$ then $(fog)^{-1}(x)$ equals

A. $\left(\frac{x+31}{5}\right)^{1/3}$

B. $\left(\frac{x-31}{5}\right)^{1/3}$

C. $\frac{x-5}{(7)^{1/3}}$

D. $\left(x - \frac{31}{5}\right)^{1/3}$

Answer: B

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50. The domain of definition of the function

f(x)=$\sin^{-1}(|(x-1)|-2)$ is

A. [-3, 0] $\cup$ [1, 3]

B. [-2, 0] $\cup$ [1,4]

C. [- 2 ,0] $\cup$ [2 ,4]

D. [-2 ,0] $\cup$ [l,2]

Answer: C

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51. If A={1,4},B ={2,3,6} and C= {2,3,7 } then which of the following is correct

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

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

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

D. $A \times (C - B) = (A \times B) - (A \times C)$

Answer: A::B::C

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52. Let X ={1,2,3,4,5} and

Y={6,7,8,9,10,11,12,13,14,15} if a funtion f : X $\rightarrow$ Y defined by f(x)=2x+5 then

A. f(f(1)) is not defined

B. f(f(2)-7)=f(2)

C. f(7)=2

D. f(2)=f(7)

Answer: A::B

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53. let $f: R \rightarrow R$ 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. on to

B. many one

C. into

D. one one

Answer: B::C

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54. If $f(x) = \sin\left\{[x+5] + \{x - \{x - \{x\}\}\}\right.$ for $x \in \left(0, \frac{\pi}{4}\right)$ is invertible, where {.} and [.] represent fractional part and greatest integer functions respectively, then $f^{-1}(x)$ is ::

$I.\ \sin^{-1} x$ II. $\frac{\pi}{2} - \cos^{-1} x$ III. $\sin^{-1}\{x\}$ IV. $\cos^{-1}\{x\}$

The correct choice is:

A. $\sin^{-1} x$

B. $\frac{\pi}{2} - \cos^{-1} x$

C. $\sin^{-1}\{x\}$

D. $\cos^{-1}\{x\}$

Answer: A::B::C

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55. If F:Q $\rightarrow$ Q is given by f(x) =x^2 then

A. $f^{-1}(9) = \{-3, 3\}$

B. $f^{-1}(-5) = \phi$

C. $f^{-1}(0) = \{0\}$

D. $f^{-1}(16) = \{-4, 4\}$

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

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Wb Jee Previous Years Questions Single Option Correct Type

1. Let f : $R \rightarrow R$ be such that f is injective and $f(x)f(y) = f(x+y)\,\forall x, y \in$ R. If f(x),f(y),f(z)are in G .P.,then x, y, z are in

A. A.P. always

B. G.P. always

C. A.P. depending on the values of x, y, z

D. G.P. depending on the values of x, y, z

Answer: C

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2. We define a binary relationon ~ on the set of all 3×3 real matrices as $A \sim B$, if and only if there exist invertible matrices P and Q suchthat $B - PAO^{-1}$. The binary relation ~ is

A. reflexive, symmetric but not transitive

B. reflexive, transitive but not symmetric

C. symmetric, transitive but not reflexive

D. an equivalence relation

Answer: D

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3. The number of onto functions from the set {1,2,...., 11} to the set {1,2, ..., 10} is

A. 5×11

B. 10

C. $\frac{11}{2}$

D. 10×11

Answer: D

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4. LEt $f(x) = 2^{100}x + 1$ and $g(x) = 3^{100}x + 1$ Then the set of real numbers x such that $f(g(x)) = x$ is

A. empty

B. a singleton

C. a finite set with more than one element

D. infinite

Answer: A

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5. For any two real numbers a and b, we define a R b if and only if $\sin^2 a + \cos^2 b = 1$. The relation R is

A. reflexive but not symmetric

B. symmetric but not transitive

C. transitive but not reflexive

D. an equivalence relation

Answer: B

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6. The minimum value of the function

$f(x) = 2|x - 1| + |x - 2|$ is

A. 0

B. 1

C. 2

D. 3

Answer: D

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7. Let the number of elements of the sets A and B be p and q respectively.

Then the number of the relations from the set A to the set B is

A. 2^{p+q}

B. 2^{pq}

C. p+q

D. pq

Answer: B

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8. Let R be the set of all real numbers and f : R $\rightarrow$ R be given by f(x) = $3x^2 + 1$. Then the set f^{-1} ([1, 6]) is

A. $\left\{-\sqrt{\frac{5}{3}}, 0\sqrt{\frac{5}{3}}\right\}$

B. $\left[-\sqrt{\frac{5}{3}}, \sqrt{\frac{5}{3}}\right]$

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

D. $\left(-\sqrt{\frac{5}{3}}, \sqrt{\frac{5}{3}}\right)$

Answer: B

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9. The function $f(x) = x^2 + bx + c$, where b and c are real constants, describes

A. one-to-one mapping

B. onto mapping

C. not one-to-one but onto mapping

D. neither one-to-one nor onto mapping

Answer: B

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10. Find the range of the function $f(x) = 3\sin\left(\sqrt{\frac{\pi^2}{16} - x^2}\right)$.

A. $\left[0, \sqrt{3/2}\right]$

B. [0,1]

C. $\left[0, 3/\sqrt{2}\right]$

D. $[0, \infty)$

Answer: D

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11. There is a group of 265 persons who like either singing or dancing or painting. In this group 200 like singing, 110 like dancing and 55 like painting. If 60 persons like both singing and dancing, 30 like both singing and painting and10 like all three activities, then the number of persons who like only dancing and painting is

A. 10

B. 20

C. 30

D. 40

Answer: C

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12. The number of real roots of equation $\log_e x + ex = 0$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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13. If $f: \left[0, \frac{\pi}{2}\right) \to R$ is defined as $f(\theta) = \begin{vmatrix} 1 & \tan\theta & 1 \\ -\tan\theta & 1 & \tan\theta \\ -1 & -\tan\theta & 1 \end{vmatrix}$

Then, the range of f is

A. $(2, \infty)$

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

C. $[2, \infty)$

D. $(-\infty, 2]$

Answer: B

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14. Let $f: R \to R$ be defined as $f(x) = \dfrac{x^2 - x + 4}{x^2 + x + 4}$. Then the range of the function $f(x)$ is

A. $\left[\dfrac{2}{3}, \dfrac{3}{2}\right]$

B. $\left(\dfrac{2}{3}, \dfrac{3}{2}\right)$

C. $\left(-\infty, \dfrac{2}{3}\right) \cup \left(\dfrac{3}{2}, \infty\right)$

D. $\left[-\dfrac{3}{2}, -\dfrac{2}{3}\right]$

Answer: C

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15. Let $S = \{a, b, c\} \varepsilon N \times N \times N : a + b + c = 21, a \leq b \leq c\}$ and T= {(a,b,c)epsilon NxxNxxN :a,b,c are in AP} where N is the set of all natural numbers . then the element in the set $S \cap T$ is

A. 6

B. 7

C. 13

D. 14

Answer: A

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16. Let R be a relation defined on the set Z of all integers and xRy when $x + 2y$ is divisible by 3. then

A. R is not transitive

B. R is symmetric only

C. R is an equivalence relation

D. R is not an equivalence relation

Answer: B

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17. if A=$\{5^n - 4n - 1 : n \in N\}$ and $B = \{16(n-1) : n \in N\}$ then

A. A=B

B. $A \cup B = \phi$

C. $A \subset B$

D. $B \subset A$

Answer: C

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18. If the function $R \to R$ is defined by $f(x) = \left(x^2 + 1\right)^{35} \forall \in R$ then f is

A. one-one but not onto

B. onto but not one-one

C. neither one-one nor onto

D. both one-one and onto

Answer: C

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19. Let P be the set of all non-singular matrices of order 3 over ú and Q be the set of all orthogonal matrices of order 3 over ú. Then,

A. P is proper subset of Q

B. Q is proper subset of P

C. Neither P is proper subset of Q nor Q is proper subset of P

D. $P \cup Q = \phi$ the void set

Answer: C

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20. On the set R of real numbers we defined $xPyi$ and only if $xy < 0$. Then the relation P is Reflexive but not symmetric

A. reflexive but not symmetric

B. symmetric but not reflexive

C. transitive but not reflexive

D. reflexive and symmetric but not transitive

Answer: B

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21. On R, a relation p is defined by xpy if and only if x - y is zero or irrational. Then

A. p is equivalence relation

B. p is reflexive but neither symmetric nor transitive

C. p is reflexive & symmetric but not transitive

D. p is symmetric & transitive but not reflexive

Answer: D

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22. On the set R of real numbers, the relation p is defined by xpy, (x ,y) $\in$ R

A. if $|x-y|<2$ then p is reflexive but neither symmetric nor transitive.

B. if $x-y<2$ then p is reflexive and symmetric but not transitive.

C. if $|x| > y$ then p is reflexive and transitive but not symmetric.

D. if $x > [y]$ then p is transitive but neither reflexive nor symmetric.

Answer: C

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23. If f: R $\rightarrow$ R be defined by $f(x) = e^x$ and g:R $\rightarrow$ R be defined by g(x) $=x^2$ the mapping gof : R $\rightarrow$ R be defined by (gof)(x) =g[f(x)] $\forall x \in R$ then

A. g o f is bijective but g is not injective

B. g o f is injective and g is injective

C. g o f is injective but g is not bijective

D. gof is surjective and g is surjective

Answer: D

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24. The domain of definition of f(x) = $\frac{\sqrt{1-|x|}}{2-|x|}$ is

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

B. $[-1, 1] \cup (2, \infty) \cup (-\infty, -2)$

C. $[-1, 1]$

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

Answer: C

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25. Let $f: R \to R$ be a function is defined by $f(x) = x^2 - \frac{x^2}{1+x^2}$, then

A. f is one - one but not onto mapping

B. f is onto but not one - one mapping

C. f is both one - one and onto

D. f is neither one - one nor onto

Answer: B

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26. Consider the function f(x)=$\cos x^2$ then

A. f is of period 2π

B. f is of period $\sqrt{2t}$

C. f is not periodic

D. f is of period π

Answer: C

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27. Let f(x)=$x\frac{1}{x-1}+\frac{1}{x}+\frac{1}{x+1}x<1$ then

A. $f(x)\leq 1$

B. $1 \leq f(x) \leq 2$

C. $2 \leq f(x) \leq 3$

D. $f(x) > 3$

Answer: C

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28. We define a binary relationon ~ on the set of all 3×3 real matrices as $A \sim B$, if and only if there exist invertible matrices P and Q suchthat $B - PAO^{-1}$. The binary relation ~ is

A. neither reflexive nor symmetric

B. reflexive and symmetric but not transitive

C. symmetric and transitive but not reflexive

D. an equivalence relation

Answer: D

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29. For any real numbers θ and ϕ we define $\theta R\phi$ if and only if $\sec^2\theta - \tan^2\phi = 1$ the relation R is

A. reflexive but not transitive

B. symmetric but not reflexive

C. both reflexive and symmetric but not transitive

D. an equivalence relation

Answer: D

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30. Let $X_n = \left\{Z = x + iy : \mid zA^2 \leq \frac{1}{n}\right\}$ for all integers $n \leq 1$ then $\bigcap_{n=1}^{\infty} x_n$ is

A. a singleton set

B. not a finite set

C. an empty set

D. a finite set with more than one elements

Answer: A

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31. Let $f: N \to R$ be such that $f(1) = 1$ and $f(1) + 2f(2) + 3f(3) + nf(n)$, for all $n \in N, n \geq 2$, where N is the set of natural numbers and R is the set of real numbers. Then the value of $f(500)$ is

A. 1000

B. 500

C. $1/500$

D. $1/1000$

Answer: A

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32. On set $A = \{1, 2, 3\}$, relation R and S are given by $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 1)\}$ and $S = \{(1, 1), (2, 2), (3, 3), (1,$

Then

A. R $\cup$ S is an equivalence relation

B. R $\cup$ S is reflexive and transitive but not symmetric

C. R $\cup$ S is reflexive and symmetric but not transitive

D. R $\cup$ S is symmetric and transitive but not reflexive

Answer: D

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33. Let R be a relation defined on the set of natural numbers N as $R = \{(x,\ y) : x,\ y \in N,\ 2x + y = 41\}$ Find the domain and range of R . Also, verify whether R is (i) reflexive, (ii) symmetric (iii) transitive.

A. ρ is an equivalence relation

B. ρ is only reflexive relation

C. ρ is only symnmetric relation

D. ρ is not transitive

Answer: C

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34. Statement-1 : For $0 \leq p < 1$ and for any positive a and b the intequality $(a + b)^p < a^p + b^p$ is valid

Staement - 2: F or $0 \leq p \leq 1$ the function $f(x) = 1 + x^p - (1 + x)^p$ decreases on $[0, \infty)$

A. $I(p) > j(p)$

B. $I(p) < j(p)$

C. $I(p) > j(p) \in \left[\frac{p}{2}, \infty\right) \& I(p) < j(p) \in \left[\left(0, \frac{p}{2}\right]\right.$

D. $I(p) < j(p) \in \left[\frac{p}{2}, \infty\right) \& I(p) < j(p) \in \left[\left(0, \frac{p}{2}\right]\right.$

Answer: D

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35. Let $a < b < 0$ and $I(n) = a^{1/n} - b^{1/n}, J(n) = (a-b)^{1/n}$ for all $n \geq 2$ then

A. $I(n) < j(n)$

B. $I(n) > j(n)$

C. $I(n) = j(n)$

D. $I(n) + j(n) = 0$

Answer: B

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36. Let f: $X \to Y$ and A , B are non void subsets of y then where the symbols have their usual interpretation

A. $f^{-1}(A) - f^{-1}(B) \supset f^{-1}(A - B)$ but the opposite does not hold

B. $f^{-1}(A) - f^{-1}(B) \subset f^{-1}(A - B)$ but the opposite does not hold

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

D. $f^{-1}(A - B) = f^{-1}(A) \cup f^{-1}(B)$

Answer: A

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37. Let S,T ,U be three non void sets and f: S $\rightarrow$ T g: T $\rightarrow$ U so that gof : S $\rightarrow$ U is surjective then

A. g and f are both surjective

B. g is surjective,f may not be so

C. f i s surjective, g may not be so

D. f and g both may not be surjective

Answer: B

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38. Which of the following real valued functions is/are not even functions?

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

B. $f(x) = x^2 \cos x$

C. $f(x) = e^x x^3 \sin x$

D. $f(x) = x - [x]$ where [x] denote the greatest integer less than or equal to x

Answer: C::D

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39. A relation p on the set of real number R is defined as follows: xpy if and only if xy $>$ 0`. Then which of the following is/are true?

A. ρ is reflexive and symmetric

B. ρ is symmetric but not reflexive

C. ρ is symmetric and transitive

D. ρ is an equivalence relation

Answer: B::C

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40. For the function F (x) = $\left[\frac{1}{[x]}\right]$, where [x] denotes the greatest integer less than or equal to x, which of the following statements are true?

A. the domain is $(-\infty, \infty)$

B. the range is {0} $\cup$ {-1} $\cup$ {1}

C. the domain is $(-\infty, 0) \cup [1, \infty)$

D. the range is {0} $\cup$ {1}

Answer: B::C

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41. Let $f: X \to X$ be such that $f(f(x)) = x$ for all $x \in X$ and $X \subseteq R$, then

A. f is one-to-one

B. f is onto

C. f is one-to-one but not onto

D. f is onto but not one-to-one

Answer: A::B

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42. On R, the set of real numbers, a relation p is defined as 'apb if and only if $1 + ab < 0$. Then

A. ρ is an equivalence relation

B. ρ is reflexive and transitive but not symmetric

C. ρ is reflexive and symmetric but not transitive

D. ρ is only symmetric

Answer: C

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43. find the inverse of $f(x) = \log_a\left(x + \sqrt{x^2+1}\right)\ a > 0, a \neq 1$

A. does not exist

B. is $x = \log_{1/a}\left(y + \sqrt{y^2+1}\right)$

C. is x= sin h (y In a)

D. is x = cosh $\left(-yIn\frac{1}{a}\right)$

Answer: C

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44. Let P and T be the subsets of X-y plane defined by

f$P = \{(x, y) : x \leq 0, y \text{ and } x^2 + y^2 = 1\}$

$T = \{(x, y) : x > 0, y > 0 \text{ and } x^8 + y^8 < 1\}$ then $P \cup T$ is

A. the void set Φ

B. P

C. T

D. $P - T^c$

Answer: B::D

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