MATHS

BOOKS - MAXIMUM PUBLICATION

RELATIONS AND FUNCTIONS

Example

1. Show that the relation R in the set is given by $A = \{x \in Z, 0 \leq x \leq 12\}$

$R = \{(a, b) : a - b$ is a multiple of $4\}$ is an equivalence relation.

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2. Let R be a Relation in the set

$A = \{1, 2, 3, 4, 5, 6\}$ define as

$R = \{(x, y) : y = 2x - 1\}$

Write R in roster form and find it's domain and range

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3. Let R be a Relation in the set

$A = \{1, 2, 3, 4, 5, 6\}$ define as

$R = \{(x, y) : y = 2x - 1\}$

Is R an equivalance relation? Justify.

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4. Let $f : R - \left\{\frac{-4}{3}\right\} \to R$ be a function defined b $f(x) = \frac{4x}{3x + 4}, x \neq -\frac{4}{3}$. Show that $f^{-1}(y) = \frac{4y}{4 - 3y}$

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5. Let ' $*$ ' is a binary operation on the set Q of rational numbers as follows,

$a * b = a - b$

Check whether the binary operation are commutative and associative. Also find the identify element if exists.

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6. Let ' $*$ ' is a binary operation on the set Q of rational numbers as follows,

$a * b = a + ab$

Check whether the binary operation are commutative and associative. Also find the identify element if exists.

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7. Let ' $*$ ' is a binary operation on the set Q of rational numbers as follows,

$a * b = a^2 + b^2$

Check whether the binary operation are

commutative and associative. Also find the identify element if exists.

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8. Let ' $*$ ' is a binary operation on the set Q of rational numbers as follows,

$a * b = (a - b)^2$

Check whether the binary operation are commutative and associative. Also find the identify element if exists.

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9. Show that the relation R on the set of natural numbers defined as $R: \{(x, y): y - x$ is a multiple of 2$\}$ is an equivalance relation

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10. Consider $f: [3, \infty) \to [1, \infty)$ given by $f(x) = x^2 - 6x + 10$. Find f^{-1}

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11. $*'$ be a binary operation on $N \times N$ defined as $(a, b) * (c, d) = (ac, bd)$

Show that $*$ is commutative.

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12. $*'$ be a binary operation on $N \times N$ defined as $(a, b) * (c, d) = (ac, bd)$

Find the identity element of $*$ if any

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13. $*'$ be a binary operation on $N \times N$ defined as $(a, b) * (c, d) = (ac, bd)$

Write an element of $N \times N$which has an inverse.

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14. Show that the relation R in the set R of Real numbers defined as $R = \{(a, b) : a \leq b^2\}$ is neither reflexive, nor symmetric, nor transitive.

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15. Consider $f: R^+ \to [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(y) = \frac{\sqrt{y+6} - 1}{3}$

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16. Let $A = R - \{3\}$ and $B = R - \{1\}$ consider the function $f: A \to B$ defined by $f(x) = \frac{x-2}{x-3}$. Is f one-one and onto? Justify your answer.

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17. Let $f: R - \left\{\frac{-4}{3}\right\} \to R$ be a function defined b $f(x) = \frac{4x}{3x+4}, x \neq -\frac{4}{3}$. Show that $f^{-1}(y) = \frac{4y}{4-3y}$

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18. The relation R defined in the set

$A = \{-1, 0, 1\}$ as

$R = \{(a, b): a = b^2\}$

Chech whether R is reflexive, symmetric and transitive.

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19. The relation R defined in the set

$A = \{-1, 0, 1\}$ as

$R = \{(a, b) : a = b^2\}$

Is R an equivalance relation

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20. Let $A = \{1, 2, 3\}$. Give an example of a relation on A which is

Symmetric but neither reflexive nor transitive.

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21. Let $A = \{1, 2, 3\}$. Give an example of a relation on A which is

Transitive but neither reflexive nor symmetric.

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22. Find fog and gof if

$f(x) = |x|$ and $g(x) = |3x + 4|$

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23. Find fog and gof if

$f(x) = 16x^4$ and $g(x) = x^{\frac{1}{4}}$

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24. Consider the binary operation $* : Q \to Q$ where Q is the set of rational numbers as defined as $a * b = a + b - ab$

Find $2 * 3$

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25. Consider the binary operation $* : Q \to Q$ where Q is the set of rational numbers as defined as $a * b = a + b - ab$

Is identity for $*$ exist? If yes, find the identity element.

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26. Consider the binary operation $* : Q \to Q$ where Q is the set of rational numbers as defined as $a * b = a + b - ab$

Are elements of Q invertible? Is yes, find the inverse of an element in Q

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27. $*$ ' is a binary operation on R defined as

$a * b = 2ab$

Determine whether $*$ is commutative and associative

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28. $*$ ' is a binary operation on R defined as

$a * b = 2ab$

Find the identity element if exists.

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29. $*$ ' is a binary operation on R defined as

$a * b = 2ab$

Find the inverse element, if exists

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30. Check if the following function satisfies the condition $f^{-1} \neq f$.

$f: R - \{0\} \to R - \{0\}, f(x) = \frac{1}{x}$

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31. Which of the following satisfies the condition $f^{-1} \neq f$.

$f: R \to R, f(x) = -x$

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32. Which of the following satisfies the condition $f^{-1} \neq f$.

$f: R - \{-1\} \to R - \{1\}, f(x) = \frac{x}{x+1}$

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33. Which of the following satisfies the condition $f^{-1} \neq f$.

$f: R - \{2\} \to R - \{2\}, f(x) = \dfrac{2x - 3}{x - 2}$

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34. If $f: R \to R$ is a function defined by

$f(x) = 3x - 2$

Show that f is one-one.

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35. Let $A = N \times N$ and $'*'$ be the binary operation. On A defined by $(a, b) * (c, d) = (a + c, b + d)$. Show that $'*'$ is commutative and associative. Find the identity for $'*'$ on A if any.

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36. If $f(x) = \frac{4x + 3}{6x - 4}, x \neq \frac{2}{3}$.

Show that $fof(x) = x$, for all $x \neq \frac{2}{3}$.

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37. If $f(x) = \dfrac{4x+3}{6x-4}, x \neq \dfrac{2}{3}.$

What is the inverse of 'f'?

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38. Let be a function defined by $f(x) = \sqrt{x}$ is

a function if it defined from f : N $\rightarrow$ N`

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39. Let be a function defined by $f(x) = \sqrt{x}$ is a function if it defined from

$f: R \to R$

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40. Let be a function defined by $f(x) = \sqrt{x}$ is a function if it defined from

$f: R \to R^+$

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41. Let be a function defined by $f(x) = \sqrt{x}$ is a function if it defined from

$f: R^+ \to R^+$

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42. Check the injectivity and surjectivity of the following functions

$f: N \to N$ defined by $f(x) = x^3$

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43. Check the injectivity and surjectivity of the following functions

$f: R \to R$ given by $f(x) = [x]$

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44. Consider the function

$$f(x) = \frac{x+1}{x-1}, x \neq 1$$

$fof(2) =$__

A. 1

B. 2

C. 3

D. 4

Answer:

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45. Consider the function $f(x) = \frac{x+1}{x-1}, x \neq 1$

what is the inverse of f?

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46. Consider the function $f(x) = \frac{x+1}{x-1}, x \neq 1$

$f(3) + f^{-1}(3)$

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47. Show that the function $f: R \to R$ defined by $f(x) = 2x - 3$ is one-one and onto. Find f^{-1}

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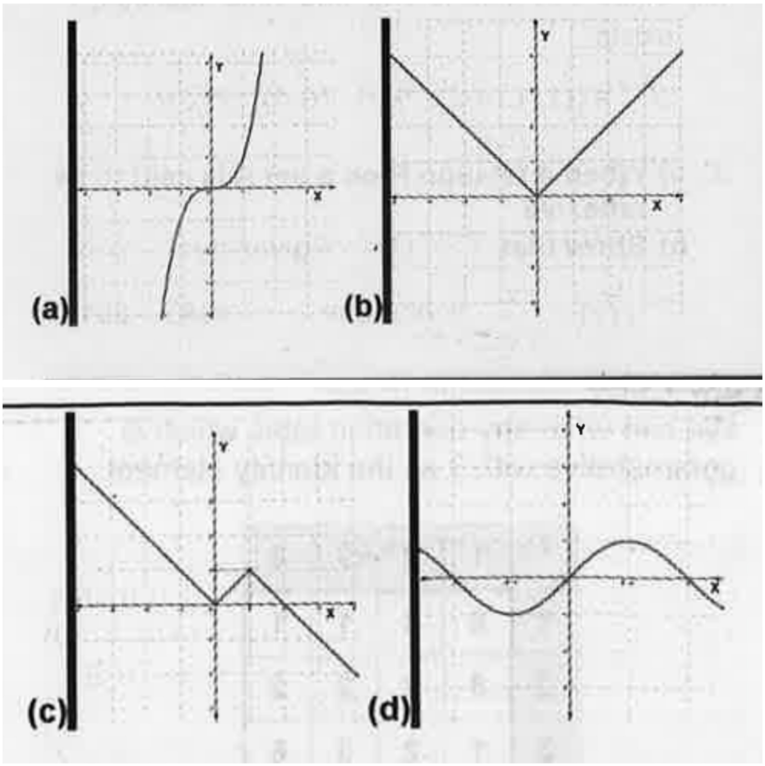
48. Which of the following figure represents the graph of a function on R which is onto but not one-one.



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49. Write a function on R which is onto but not one-one.

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50. $A = \{1, 2, 3, 4, 6\}$, $*$ is a binary operation on A is defined as $a * b = HCF$ of a and b.

Represent $*$ with the help of an operation table.

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51. $A = \{1, 2, 3, 4, 6\}$, $*$ is a binary operation on A is defined as $a * b = HCF$ of a and b. Find the identity element.

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52. $A = \{1, 2, 3, 4, 6\}$, $*$ is a binary operation on A is defined as $a * b = HCF$ of a and b. Draw its operation table.

Write a commutative binary operation on A

with 3 as the identity element. (Hint: Operation table may be used.

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53. Let $*$ be a binary operation on the set of all real numbers R defined by $a * b = a + b + a^2 b$ for a, b R.

Find $2 * 6$ and $6 * 2$.

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54. Let $*$ be a binary operation on the set of all real numbers R defined by $a * b = a + b + a^2 b$ for a, b belongs to R. Prove that $*$ is neither commutative nor associative.

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55. Let $*$ be a binary operation on the set of all real numbers R defined by

$a * b = a + b + a^2 b$ for a, b R.

Find the identity elements in R if exists.

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56. Consider $f : \{3, 4, 5, 6\} \to \{8, 10, 12, 13, 14\}$ and $f = \{(3, 8), (4, 10), (5, 12), (6, 14)\}$. State whether f has inverse? Give reason.

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57. Consider $f: R \to R$ given by $f(x) = 3x + 2$ show that f is invertible. Find the inverse of f

Watch Video Solution

58. Consider the set $A = \{1, 2, 3, 4, 5\}$, and $B = \{1, 4, 9, 16, 25\}$ and a function $f: A \to B$ defined by $f(1) = 1$, $f(2) = 4$, $f(3) = 9, f(4) = 16$ and $f(5) = 25$.

Show that f is one-to-one.

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59. Consider the set $A = \{1, 2, 3, 4, 5\}$, and $B = \{1, 4, 9, 16, 25\}$ and a function $f: A \to B$ defined by $f(1) = 1$, $f(2) = 4$, $f(3) = 9, f(4) = 16$ and $f(5) = 25$.

Show that f is onto.

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60. Consider the set $A = \{1, 2, 3, 4, 5\}$, and $B = \{1, 4, 9, 16, 25\}$ and a function

$f: A \to B$ defined by $f(1) = 1$, $f(2) = 4$, $f(3) = 9, f(4) = 16$ and $f(5) = 25$.

Does f^{-1} exists? Explain.

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61. When a relation R on a set A is said to be reflexive

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62. Show that $f:[-1,1] \to R$ given by $f(x) = \frac{x}{x+2}$ is one-one.

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63. The function $f:N \to N$ given by $f(x) = 2x$

A. one-one and onto

B. one-one and not onto

C. not one-one and not onto

D. onto but not one-one

Answer:

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64. Find $gof(x)$, if $f(x) = 8x^3$ and $g(x) = x^{\frac{1}{3}}$

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65. Let $*$ be an operation such that $a * b = LCM$ of a and b defined on the set

$A = \{1, 2, 3, 4, 5\}$. Is $*$ a binary operation?

Justify your answer.

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66. $f : \{1, 2, 3, 4\} \to \{5\}$ defined by

$f = \{(1, 5), (2, 5), (3, 5), (4, 5)\}$.

Does the function is invertible?

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67. $A = R - \left\{\frac{7}{5}\right\}, B = R - \left\{\frac{3}{5}\right\}$

$f: A \to B$ defined by $f(x) = \frac{3x+4}{5x-7}$

$g: B \to A$ defined by $g(y) = \frac{7y+4}{5y-3}$

Find gof

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68. Let $A = N \times N$, N-set of natural numbers and ' $*$ ' be a binary operation on A defined by $(a, b) * (c, d) = (ac - bd, ad + bc)$.

Show that ' $*$ ' is commutative on A.

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69. Let N be the set of Natural numbers. Consider the function $f: N \to N$ defined by $f(x) = x + 1, x \in N$

Prove that f is not onto.

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70. Let N be the set of Natural numbers. Consider the function $f: N \to N$ defined by

$f(x) = x + 1, x \in N$

If $g(x) = \begin{cases} x - 1 & x > 1 \\ 1 & x = 1 \end{cases}$ then find gof

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71. Let N be the set of Natural numbers. Consider the function $f: N \to N$ defined by

$f(x) = x + 1, x \in N$

Check whether f is an onto function.

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72. Give a relation on a set $A = \{1, 2, 3, 4\}$ which is reflexive, symmetric and not transitive.

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73. Show that $f: [-1, 1] \to R$ given by $f(x) = \frac{x}{x+2}$ is one-one.

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74. Let ' $*$ ' be a binary operation on Q^+ defined by '$a * b = \frac{ab}{6}$'. Find the inverse of 9 with respect to ' $*$ '.

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75. $* : R \to R$ given by $a * b = 3a^2 - b$

Find the value of $2 * 3$. Is ' $*$ ' commutative? Justify your answer.

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76. $f: R \to R$ is defined by $f(x) = x^2 - 3x + 2$ Find $fof(x)$ and $fof(1)$.

Watch Video Solution

77. Consider $f: R \to R$ given by $f(x) = 5x + 2$

Show that f is one-one.

Watch Video Solution

78. Consider $f: R \to R$ given by $f(x) = 5x + 2$

Is f invertible? Justify your answer.

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79. Let $*$ be a binary operation on N defined by $a * b = HCF$ of a and b

Is $*$ commutative?

Watch Video Solution

80. Let $*$ be a binary operation on N defined by $a * b = HCF$ of a and b

Is $*$ associative?

Watch Video Solution

81. Let $f: R \to R$ be given by $f(x) = \frac{2x+1}{3}$

find

fof and show that f is invertible.

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82. Find the identity element of the binary operation $*$ on N defined by $a * b = ab^2$.

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83. What is the minimum number of pairs to form a non - zero reflexive relation on a set of n elements?

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84. On the set R of real numbers, S is a relation defined as

$S = \{(x, y) / x \in R, y \in R, x + y = xy\}$.

Find $a \in R$ such that 'a' is never the first element of an ordered pair in S. Also find $b \in R$ such that 'b' is never the second element of an ordered pair in S.

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85. Consider the function $f(x) = \frac{3x+4}{x-2}, x \neq 2$. Find a function on a suitable domain such that $gof(x) = x = fog(X)$.

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86. If $f: R \to R$ and $g: R \to R$ defined by $f(x) = x^2$ and $g(x) = x + 1$, then $gof(x)$ is

A. $(x+1)^2$

B. $x^3 + 1$

C. $x^2 + 1$

D. $x + 1$

Answer:

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87. Consider the function $f: N \to N$, given by $f(x) = x^3$. Show that the function 'f' is injective but not surjective.

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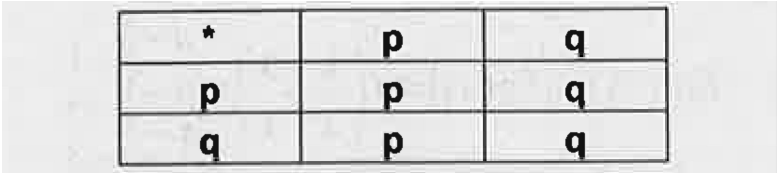
88. The given table shows an operation $*$ on $A = \{p, q\}$ (Figure)

Is $*$ a binary operation?



*	p	q
p	p	q
q	p	q

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89. The given table shows an operation $*$ on $A = \{p, q\}$ (Figure)

Is $*$ commutative? Give reason.

*	p	q
p	p	q
q	p	q

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90. Let R be relation defined on $A = \{1, 2, 3\}$ by $R = \{(1, 3), (3, 1), (2, 2)\}$ is

A. Reflexive

B. Symmetric

C. Transitive

D. Reflexive but not Transitive

Answer:

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91. Find fog and gof if $f(x) = |x + 1|$ and $g(x) = 2x - 1$

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92. Let $*$ be a binary operation defined on $N \times N$ by $(a, b) * (c, d) = (a + c, b + d)$

Find the identity element for $*$ if it exists.

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93. If $R = \{(x, y) : x, y \in Z, x - y \in Z\}$, then the relation R is

A. Reflexive but not transitive

B. Reflexive but not symmetric

C. symmetric but not transitive

D. An equivalance relation

Answer:

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94. Let $*$ be a binary operation on the set Q of rational numbers by $a * b = 2a + b$. Find $2 * (3 * 4)$ and $(2 * 3) * 4$.

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95. Let $f: R \to R, g: R \to R$ be two one-one functions. Check whether gof is one-one or not.

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96. A function $f: X \to Y$ is onto if range of f =.....

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97. Let $f: \{1, 3, 4\} \to \{3, 4, 5\}$ and $g: \{3, 4, 5\} \to \{6, 8, 10\}$ be functions defined by

$f(1) = 3, f(3) = 4, f(4) = 5,$

$g(3) = 6, g(4) = 8, g(5) = 8$,then $(gof)(3)$ =.....

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98. Let Q be the set of Rational numbers and '$*$' be the binary operation on Q defined by '

$a * b = \frac{ab}{4}$' for all a,b in Q.

What is the identity element of ' $*$ ' on Q?

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99. Let Q be the set of Rational numbers and ' $*$ ' be the binary operation on Q defined by ' $a * b = \frac{ab}{4}$' for all a,b in Q.

Find the inverse element of ' $*$ ' on Q.

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100. Show that

$a * (b * c) = (a * b) * c, \forall a, b, c \in Q.$

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101. Let R be the relation on the set N of natural numbers given by

$R = \{(a, b) : a - b > 2b > 3\}$

Choose the correct answer

A. $(4, 1) \in R$

B. $(5, 8) \in R$

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

D. $(10, 6) \in R$

Answer:

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102. If $f(x) = 8x^3$ and $g(x) = x^{\frac{1}{3}}$, find $g(f(x))$ and $f(g(x))$

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103. Let $*$ be a binary operation on the set Q of rational numbers defined by $a * b = \frac{ab}{3}$. Check whether $*$ is commutative and associative?

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104. Let $f(x) = \frac{x-1}{x-3}, x \neq 3$ and $g(x) = \frac{x-3}{x-1}, x \neq 1$ be two functios defined on R

Find $fog(x), x \neq 0$

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105. Let $f(x) = \frac{x-1}{x-3}, x \neq 3$ and $g(x) = \frac{x-3}{x-1}, x \neq 1$ be two functios defined on R

Find $f^{-1}(x)$ and $g^{-1}(x), x \neq 1$

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106. Let $f(x) = \frac{x-1}{x-3}, x \neq 3$ and $g(x) = \frac{x-3}{x-1}, x \neq 1$ be two functios defined

on R

Find $(gof)^{-1}(x)$

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