MATHS

BOOKS - S CHAND MATHS (ENGLISH)

RELATIONS AND FUNCTIONS

Example

1. If $A = \{a, b\}$, then all possible ordered paris are (a,a) (b,b) (a,b) (b,a).

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2. If $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$. Then all possible ordered pairs such that in each ordered pair the first component is an element of set A and second component is an element of set B are obtained by pairing

each element from set A with each element form set B. This can be done by the following scheme:

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3. Express $\{(x, y) : x^2 + y^2 = 25, \text{where} x, y \in W\}$ as a set of ordered pairs.

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4. The number of elements in the set $\{(a, b) : 2a^2 + 3b^2 = 35, a, b, \in Z\}$, where Z is set of all integers is

A. 2

B. 4

C. 8

D. 12

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

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5. If $A = \{a, b\}$ and $B = \{1\}$, then $A \times B = \{(a, 1), (b, 1)\}$ and $B \times A = \{(1, a), (1, b)\}$

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6. If $A = \{2, 4, 6\}$, then $A^2 = A \times A = \{(2, 2)(2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6, 6)$

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7. If $A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$. Find A and B.

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8. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $A \times A$

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9. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $A \times B$

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10. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $B \times A$

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11. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $(B \times B)$

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12. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $n(A \times A)$

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13. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $n(A \times B)$

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14. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $n(B \times A)$

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15. Let $A = \{x \in N : x \leq 4\}$ and $B = \{y \in N : 3 < y \leq 5\}$. Find out $n(A \times B)$

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16. If $A = \{1, 2, 3\}, B = \{4, 5\}, C = \{1, 2, 3, 4, 5\}$ find $(i) A \times B (ii) C \times B (iii) B \times B$ Hence prove that $(C \times B) - (A \times B) = B \times B.$

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17. If each one of the two sets A and B has 3 elements, how many elements are there in $A \times B$? If three of the elements in $A \times B$ be (2,3), (4,4) and (6,6), find the remaining elements.

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18. Is $A \times \phi$ the empty set or not, where ϕ denotes the empty set and A is any set?

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19. Let $A = \{1, 2\},\ B = \{1, 2, 3, 4\},\ C = \{5, 6\} and\ D = \{5, 6, 7, 8\}$.

Verity that: $A \times (B \cap C) = (A \times B) \cap (A \times C)$

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20. Let $A = \{1, 2), B = \{1, 2, 3, 4\}, C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$

verify that

$A \times C$ is a subset of $B \times D$.

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21. If $A = \{1, 4\} B = \{2, 3, 6\}$ and $C = \{2, 3, 7\}$ verify that $A \times (B - C) = (A \times B) - (A \times C)$.

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22. If $A \subseteq B$, and $C \subseteq D$, prove that $A \times C \subseteq B \times D$.

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23. Taking $A = \{1, 2, 3, 4\}, B = \{4, 5\}$ in Ex.8, represent $A \times B$ and $B \times B$ pictorially, using arrows.

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24. Taking $A = \{1, 3, 5, 7\}$ and $B = \{2, 4, 6\}$, draw the graphs of (i) $A \times A$ (ii) $B \times A$.

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25. If $A = \{-1, 1\}$, find $A \times A \times A$.

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26. Let R be the set of real numbers. What does $(R \times R \times R)$ represent?

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27. Let R be the relation from $A = \{1, 2, 3, 4, 5, 6\}$ to $B = \{1, 3, 5\}$ which is defined by the open sentence "x is less than y".

(i) Find the solution set of R, that is write R as set of ordered pairs.

(ii) Plot R on a co-ordinate diagram of $A \times B$.

(iii) state the domaing, range and codomain of R.

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28. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$. Which of the following are relations from A to B? $\{(a, y), (a, z), (c, x), (d, y)\}$

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29. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$. Which of the following are relations from A to B? $\{(a, x), (b, y), (c, x), (a, d)\}$

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30. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$. Which of the following are relations from A to B? $\{(a, x), (y, d), (x, c)\}$

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31. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$. Which of the following are relations from A to B? $\{(y, a), (z, a), (z, c), (y, d)\}$

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32. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$. Which of the following are relations from A to B? $\{(a, x), (x, a), (b, y), (y, b)\}$

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33. Let $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$. Which of the following are relations from A to B? $\{(a, x), (b, y), (c, z), z\}$

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34. If $A = \{x, y, z\}$ and $B = \{1, 2\}$, then the number of relations from A to B is

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35. Determine the domain and range of the following relations : $\{(-3,1),(-1,1),(1,0),(3,0)\}$

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36. Determine the domain and range of the following relations : $\{(x,y): x \text{ is a multiple of } 3 \text{ and y is a multiple of } 5\}$

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37. Determine the domain and range of the following relations : $\{(x,x^2): \text{ x is a prime numbers less than } 15\}$

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38. Let N be the set of nutural numbers. Deseribe the following relation in words giving its domain and the range.

$\{(1, 1), (16, 2), (81, 3), (256, 4)\}$

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39. I is the set of integers. Deseribe the following relations in words, giving its domain and range.

$\{(0, 0), (1, -1), (2, -2), (3, -3).....\}$

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40. Let $A = \{1, 2, 3, 4, 6\}$. Let R be the relation on A defined by $\{(a, b) = a \in A, b \in A, \quad \text{a divides b}\}$. Find

(i) R (ii) domain of R (iii) range of R

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41. If $A = \{1, 2, 3, 4\}, B = \{5, 6, 7, 8\}$, then which of the following are relations from A to B? Give reasons for your answer.

$R_1 = \{(1, 5), (2, 7), (3, 8)\}$

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42. If $A = \{1, 2, 3, 4\}$, $B = \{5, 6, 7, 8\}$, then which of the following are relations from A to B? Give reasons for your answer.

$R_2 = \{(6, 2), (3, 7), (4, 7)\}$

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43. Let $A = \{x, y, z\} and B = \{1, 2\}$. Find the number of relations from A to B.

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44. Which of the following relation are functions? Give reasons. In cane of a function, determine its domain and range.

$\{(1, -2), (3, 7), (4, -6), (8, 11)\}$

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45. Which of the following relation are functions? Give reasons. In cane of a function, determine its domain and range.

$\{(1, 0), (1, -1), (2, 3), (4, 10)\}$

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46. Which of the following relation are functions? Give reasons. If it is a function, determine its domain and range.

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

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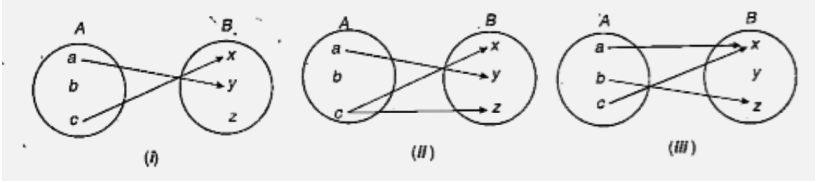
47. State whether or not each of the following diagrams defines a function



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48. Which of the following relations are functions ? y=3x+2.

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49. Which of the following relations are functions ?

a is the capital of b where $b \in B$ and B is the set of all countries, $a \in A$ and A is the set of capital cities of countries.

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50. Which of the following relations are functions ? $y < x + 3$.

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51. Which of the following relations are functions ?

y is the Maths teacher of x where x represents any pupll taking up Maths in a school.

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52. Which of the following relations are functions ?

y is a Maths pupil of x, where x represents any Maths teacher in a school.

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53. State the domain of these functions :

$f: x \to 5x$

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54. State the domain of these functions :

$g: x \to 5x, x \in Z$

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55. State the domain of these functions :

$h(x): \frac{2}{x-7}$

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56. State the domain of these functions :

$F: x \to 5x, x \in \{0, 1, 2\}$

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57. State the domain of these functions :

$f: x \to \frac{x}{5}$

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58. State the domain of these functions :

$F: x \to \frac{6}{x}$

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59. State the domain of these functions :

$H: x \to x^2 + 5x - 6$

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60. State the domain of these functions :

$g: x \to \frac{x - 4}{(x - 3)(x + 6)}$

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61. State the domain of these functions :

$g: x \to \frac{x}{1}, x \in \{2, 4, 6\}$

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62. State the domain of these functions :

$g: x \to \frac{1}{x}, x \in R$

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63. Does the relation $\{(x, y)|y = |x|, x \in R\}$ define a function? Write the range and draw the graph.

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64. Does the relation 'a square root of' in the set of real numbers represent a function ?

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65. Find whether the following functions are one-one or not.

$f: R \to R$, defined by $f(x) = x^3, x \in R$

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66. Find whether the following functions are one-one or not.

$f: Z \to Z$, defined by $f(x) = x^2 + 5$ for all $x \in Z$

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67. Find whether the following functions are one-one or not.

$f: R - \{3\} \to R$, defined by $f(x) = \frac{5x + 7}{x - 3}, x \in R - \{3\}$

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68. Show that the modulus function $f: R \to R$, given by $f(x) = |x|$, is not one-one function.

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69. Prove that the greatest integer function $f: R \to R$, given by $f(x) = [x]$ is a many-one function.

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70. Find whether the following is onto function (surjection) or not.

$f: R \to R$ defined by $f(x) = x^3 + 5$ for all $x \in R$

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71. Find whether the following are into functions (surjections) or not.

$f: R \to R$ defined by $f(x) = x^2 + 3$ for all $x \in R$

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72. Find whether the following are into functions (surjections) or not.

$f: Z \to Z$ defined by $f(x) = 5x - 9$ for all $x \in Z$.

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73. If $A = R - \{3\}$ and $B = R - \{1\}$ and $f: A \to B$ is a mapping defined by $f(x) = \dfrac{x-2}{x-3}$ show that f is one-one onto function.

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74. Let $f = N \to N$ be defined by $f(x) = x^2 + x + 1, x \in N$, then prove that f is one-one but not onto.

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75. Let $f: R \to R$ be a function defined by $f(x) = \frac{x-m}{x-n}$, where $m \neq n$. Then show that f is one-one but not onto.

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76. The function $f: R \to R$ defined by $f(x) = e^x$ is

A. (i) Onto

B. (ii) Many-one

C. (iii) One-one and into

D. (iv) Many one and onto.

Answer:

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77. If $f: R \to R$ be defined as $f(x) = x^4$. Choose the corrent answer : (a) f is one-one onto (b)f is many-one onto (c)f is one-one but not onto (d)f is

neither one-one nor onto

A. f is one-one onto

B. f is many-one onto

C. f is one-one but not onto

D. f is neither one-one nor onto

Answer: D

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78. Let $f: N \to N$ be defined by $f(n) = \begin{cases} \frac{n+1}{2} & \text{if n is odd} \\ \frac{n}{2} & \text{if n is even} \end{cases}$ for all $n \in N$.

Prove that f is many-one, onto function.

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79. If $f(x) = \frac{x - |x|}{|x|}$, then find f(-1).

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80. If $f(x) = \frac{x}{x-1}$, then prove that $\frac{f(a)}{f(a+1)} = f(a^2)$

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81. If $f(x) = \frac{1}{\sqrt{x+2\sqrt{2x-4}}} + \frac{1}{\sqrt{x-2\sqrt{2x-4}}}$ for $x > 2$ then find f(11).

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82. If $f(x) = \frac{1+x}{1-x}$, show that $f \mid f(\tan\theta)] = -\cot\theta$.

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83. If $f(x) = \cos(\log x)$, then $f(x^2)f(y^2) - \frac{1}{2}\left[f(x^2y^2) + f\left(\frac{x^2}{y^2}\right)\right] =$

A. -2

B. -1

C. $\frac{1}{2}$

D. 0

Answer: D

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84. If $f(x)=\begin{cases}2x-1 & \text{when } x\leq 0\\ x^2 & \text{when } x>0\end{cases}$, then find $f\left(\frac{1}{2}\right)$ and $f\left(\frac{-1}{2}\right)$

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85. If $f(x)=\begin{cases}1+x, & -1\leq x<0\\ x^2-1, & 0<x<2\\ 2x, & 2\leq x\end{cases}$

Find $f(3), f(-2), f(0), f\left(\frac{1}{2}\right) f(2-h), f(-1+h)$, where $h>0$ is very small.

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86. Graph the following piece wise-defined function :

$$\begin{cases} -x, & x < 0 \\ x^2, & 0 \leq x \leq 1 \\ 1, & x > 1 \end{cases}$$

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87. Examine whether $x\left(\frac{a^x+1}{a^x-1}\right)$ is an odd or even function.

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

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89. Determine whether the function is even, odd or niether even or odd.

(a) $f(x) = 5 - x^2$ (b) $f(x) = |-x|$ (c) $f(x) = [x]$ (d) $f(x) = |x-2|$

(e) $f(x) = -x|x|$

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90. If f is an odd function and f(0) is defined, must f(0)=?

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91. If $f(x) = x^2 + kx + 1$ for all x and f is an even function, find k, $k \in R$

.

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92. The function $f(x) = \sin x + \cos x$ will be

A. an even function

B. an odd function

C. a constant function

D. None of these

Answer: d

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93. If f is a real function, find the domain of

$$f(x) = \sqrt{(a^2 - x^2)}$$

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94. If f is a real function, find the domain of

$$f(x) = \frac{1}{3x + 2}$$

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95. If f is a real function, find the domain of

$$f(x) = \frac{1}{\log|x|}$$

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96. If f is a real function, find the domain of

$f(x) = 10^{-x}$

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97. Find the domain of

$\sqrt{x} + \sqrt{2x - 1}$

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98. Find the domain of

$\log(x - 2) - \sqrt{(3 - x)}$

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99. Find the domain of the following functions.

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

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100. Find the domain of the following functions.

$f(x) = \dfrac{\sin^{-1}(3 - x)}{\ln(|x| - 2)}$

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101. Find the domain of the following functions.

$f(x) = \sin^{-1} \log_2 \dfrac{x}{3}$

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102. Find the domain of the following functions.

$f(x) = \dfrac{\log_2(x + 3)}{(x^2 + 3x + 2)}$

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103. Find the domain of the following functions.

$$f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$$

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104. Find the domain of the following functions.

$$f(x) = \log_e = \frac{2+x}{2-x}$$

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105. The domain of the definition of the function $f(x) = \sqrt{1+\log_e(1-x)}$ is

A. $-\infty < x \leq 0$

B. $-\infty < x \leq \frac{e-1}{e}$

C. $-\infty < x \leq 1$

D. $x \geq 1 - e$

Answer: B

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106. Find the domain of the function : $f(x) = \frac{3}{4 - x^2} + (\log)_{10}(x^3 - x)$

A. (1,2)

B. $(-1, 0) \cup (1, 2)$

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

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

Answer: D

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107. Find the range of the following functions.

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

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108. Find the range of the following functions.

$$f(x) = \sqrt{3x^2 - 4x + 5}$$

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109. Find the range of the following functions.

$$f(x) = \log_e\left(3x^2 - 4x + 5\right)$$

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110. Find the range of the following functions.

$$f(x) = \frac{5}{3 - x^2}$$

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111. Find the domain and range of the function

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

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112. Find the domain and range of the function $f(x) = [\sin x]$

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113. The absolute value function $y = f(x) = |x|$ Draw its graph.

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114. Draw the graph of the function $f(x) = |x - 1|$

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115. Draw the graph of the function $f(x) = -x|x|$.

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116. Draw the graph of following functions.

$$f(x) = \frac{|x|}{x}$$

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117. Draw the graph of following functions.

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

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118. Draw the graph of the function $y = |x - 2| + |x - 3|$

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119. Draw the graph of the function $y = [x]$ in $-2 < x < 4$

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120. Draw the graph of $y = 2^x$.

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121. Draw the graph of $y = \log_2 x$.

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122. Draw the graph of the function $y = \frac{1}{x}$ for x:-4≤x≤4`

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123. Graph the function $xy - y - x - 2 = 0$.

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Exercise 2 A

1. $x \in \{2, 4, 6, 9\}$ and $y \in \{4, 6, 18, 27, 54\}$. Form all ordered pairs (x,y) such that x is factor of y and $x \leq y$.

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2. Find the numbers x and y if $(x + 3, y - 5) = (5, 0)$

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

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

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

Watch Video Solution

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

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

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

Watch Video Solution

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

Watch Video Solution

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

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11. If $P = \{m, n)$ and $Q = \{n, m\}$, then $P \times Q = \{(m, n), (n, m)\}$

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12. $\{(a, x), (a, y), (b, x), (b, y)\}$ is a product set.

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13. If n(A)=x and n(B)=y and $A \cap B = \phi$ then $n(A \times B) = xy$.

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14. If A and B are non-empty sets, then $A \times B$ is a non-empty set of ordered pairs (x,y) such that $x \in B$ and $y \in A$.

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15. Given $A = \{1, 2), B = \{3), C = \{4, 5\}$, test whether the following are true :

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

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16. Given $A = \{1, 2\}, B = \{3\}, C = \{4, 5\}$, test whether the following is true:

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

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17. If $A = \{1, 2, 3, 4\}, B = \{5, 7, 9\}, C = \{2, 4, 6\}$, find

(i) $A \times B$ (ii) $(B \times C)$ (iii) $C \times A$ and draw their graphs.

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18. Some elements of $A \times B$ are $(a, x), (c, y), (d, z)$. If $A = \{a, b, c, d\}$, find the remaining elements of $A \times B$ such that $n(A \times B)$ is least.

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19. The ordered pairs (1,1),(2,2),(3,3) are among the elements in the set $A \times B$. If A and B have 3 elements each, how many elements in all does the set $A \times B$ have? Also find the remaining elements.

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20. If $A = \{1, 4\}, B = \{2, 3, 6\}$ and $C = \{2, 3, 7\}$, then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$

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21. If $A = \{1, 4\}, B = \{2, 3, 6\}$ and $C = \{2, 3, 7\}$, then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$

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22. If $A = \{2, 3\}, B = \{1, 2, 3\}, C = \{2, 3, 4\}$ show that $A \times A = (B \times B) \cap (C \times C)$.

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23. 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 and z are distinct elements.

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24. The Cartesian product $A \times A$ has 9 elements among which are found $(1, 0)$ and $(0, 1)$. Find the set A and the remaining elements of $A \times A$.

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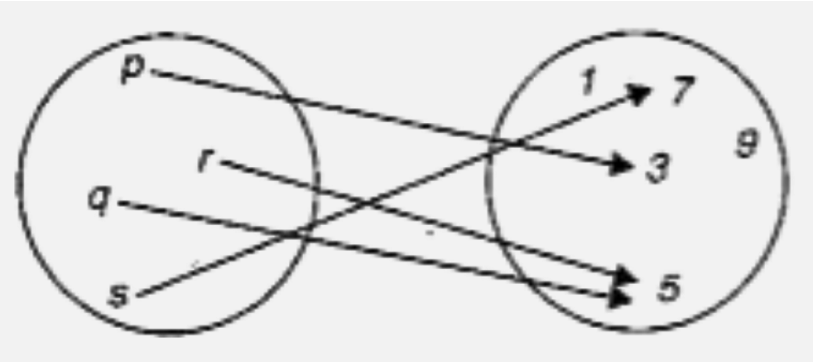
Exercise 2 B

1. Write down the relation shown by the arrow diagram, by listing the ordered pairs. State the domain, co-domain, and the range of the relation.



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2. Which of the following are relations from B to A, where $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$?

$\{(z, x), (z, y), (x, a)\}$

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3. Which of the following are relations from B to A, where $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$?

$\{(z, a), (z, b), (z, c), (z, d)\}$

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4. Which of the following are relations from B to A, where $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$?

$\{(x, b), (y, a)\}$

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5. Which of the following are relations from B to A, where $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$?

$\{(b, y), (c, z), (a, x)\}$

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6. Which of the following are relations from B to A, where $A = \{a, b, c, d\}$ and $B = \{x, y, z\}$?

$\{(x, d), (y, c), (z, b)\}$

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7. In each of the following, state which of the ordered pairs belong to the given relations?

$\{(x, y) : x > y + 5\}, (1, 0), (8, 2), (0, 1), (2, 8), (9, 3), (10, 7), (123, 4)$

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8. In each of the following, state which of the ordered pairs belong to the given relations?

$\{(x, y) : xy = 12\}, (3, 4), (4, 3), (12, 0), (0, 12), (12, 1), (6, 2), (7, 5)$

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9. In each of the following, state which of the ordered pairs belong to the given relations?

$$\left\{(x, y): y = \frac{x+3}{x-3}, x \neq 1\right\}: (0, 1), (2, 5), (5, 2), (3, 3), (7, 5), \left(7, \frac{5}{3}\right)$$

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10. Let N be the set of natural numbers. Describe the following relations in words, giving their domain and the range. $\{(2, 1), (4, 2), (10, 5), (18, 9), (20, 10)\}$

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11. Let N be the set of natural numbers. Describe the following relations in words, giving their domain and the range. $\{(3, 1), (6, 2), (15, 5)\}$

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12. Let N be the set of natural numbers. Describe the following relations in words, giving their domain and the range. $\{(1, 4), (5, 16), (7, 22), (12, 37)\}$

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13. Z is the set of integers. Describe the following relation in set builder form, given its domain and range.

$\{(0, -7), (2, -5), (4, -3), (-13, -20), \ldots\ldots\}$

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14. Write down the domain and range of the relation (x,y): x=3y and x and y are natural numbers less than 10.

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15. Determine the domain and range of the relation R.

$R = \{(x+1, x+5) \mid x \in \{0, 1, 2, 3, 4, 5\}\}$. Draw the graph of R.

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16. Determine the domain and range of the relation R.

$R = \{(x, x^3) \mid x \text{ is a prime number less than } 10\}$

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17. Given $A = \{-2, -1, 0, 1, 2\}$, list the ordered pairs determined by each of the following relations applied on A:

R_1 = "is less than"

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18. Given $A = \{-2, -1, 0, 1, 2\}$, list the ordered pairs determined by each of the following relations applied on A:

R_2 = "is the square of"

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19. Given $A = \{-2, -1, 0, 1, 2\}$, list the ordered pairs determined by each of the following relations applied on A:

R_3 = "is the additive inverse of"

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20. Given $A = \{-2, -1, 0, 1, 2\}$, list the ordered pairs determined by each of the following relations applied on A:

R_4 = "is equal to"

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21. Given $A = \{2, 3, 4, 5, 6\}$. List the elements of each of the following relations:

$\{(x, y) \in A \times A : x = y\}$

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22. Given $A = \{2, 3, 4, 5, 6\}$. List the elements of each of the following relations:

$\left\{(x, y) \in A \times A : x > y, \frac{x}{y} \not\in W\right\}$

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23. Given $A = \{2, 3, 4, 5, 6\}$. List the elements of each of the following relations:

$\{(x, y) \in A \times A : x \text{ is a divisor of y and } x \neq y\}$

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24. If A is the set of even natural numbers less than 8 and B in the set prime numbers less than 7, then the number of relations from A to B is

A. 2^9

B. 9^2

C. 3^2

D. $2^9 - 1$

Answer: A

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25. Let A be a finite set. The number of relations on A where A has 3 elements are : (i) 9 (ii) 6 (iii) 256 (iv) 512

A. 9

B. 0.81

C. 24.3

D. 512

Answer: D

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26. Let n(A)=p. Then the number of all relations on A is

A. 2^p

B. $2^{p!}$

C. 2^{p^2}

D. None of these

Answer: C

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Exercise 2 C

1. Let $X = \{1, 2, 3, 4\}$. Determine whether or not each relation is a function from X into X.

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

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2. Let $X = \{1, 2, 3, 4\}$. Determine whether or not each relation is a function from X into X.

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

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3. Let $X = \{1, 2, 3, 4\}$. Determine whether or not each relation is a function from X into X.

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

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4. State for each of the following relations whether it is function or not. (Write Yes or No)

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

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5. State for each of the following relations whether it is function or not. (Write Yes or No)

$\{(x, y) : x \in A, y \in B \text{ is surname of x}\}$ where A is the set of people in India and B is the set of surnames.

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6. State for each of the following relations whether it is function or not. (Write Yes or No)

$\{(x, y) : x \in A, y \in B, y \text{ is the area of a square of side x}\}$ where A is the set of measurements of length.

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7. State for each of the following relations whether it is function or not. (Write Yes or No)

$\{(x, y) : x \in B, y \in P, y \text{ is a passenger on x}\}$ where B is the set of buses of a school and P is set of pupils of some schools.

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8. State for each of the following relations whether it is function or not. (Write Yes or No)

$\{(x, y) : x \in A, y \in B, y \text{ is sewn onto y}\}$, where A is the set of buttons and B is the set of shirts.

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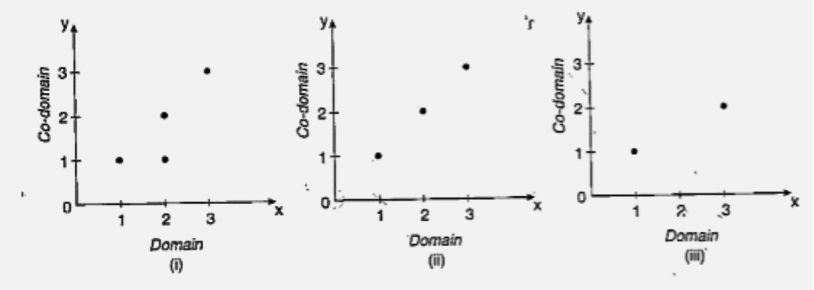
9. The ordered pairs are represented by the points shown. For each diagram, state whether it represents a relation or a function. Justify your

answer.



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10. The domain and range of a function $f(x) = \frac{3}{x} + 1$ are subsets of A and B respectively, where $A = \left\{ -\frac{1}{2}, 0, \frac{2}{3}, \frac{6}{7}, 1 \right\}$ and $B = \left\{ -5, 0, 4\frac{1}{2}, 5, 5\frac{1}{2} \right\}$. List the elements of the function as ordered pairs.

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11. Which of the four statements given below is different from others?

(a) $f: A \to B$ (b) $f: x \to f(x)$

(c) f is a mapping of A into B (d) f is a function of A into B

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12. $A = \{-2, -1, 1, 2\}$ and $f = \left\{\left(x, \frac{1}{x}\right), x \in A\right\}$

List the range of f

Watch Video Solution

13. $A = \{-2, -1, 1, 2\}$ and $f = \left\{\left(x, \frac{1}{x}\right), x \in A\right\}$

List the range of f

Watch Video Solution

14. $A = \{-2, -1, 1, 2\}$ and $f = \left\{\left(x, \frac{1}{x}\right), x \in A\right\}$

Is f a function?

Watch Video Solution

15. $f: x \rightarrow$ highest prime factor of x.

Find the range of f when the domain is $\{12, 13, 14, 15, 16, 17\}$.

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16. $f: x \rightarrow$ highest prime factor of x.

State a domain of five integers for which the range is (3).

Watch Video Solution

17. $f: x \rightarrow$ highest prime factor of x.

A set of positive integers is called S. What can be said about these integers if (f)(S)=S?

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18. For $x > 3$, $f(x) = 3x - 2$ and for $-2 \leq x \leq 2$, $f(x) = x^2 - 2$, find f(0)+f(4)

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19. If $f: R \to R$ defined by $f(x) = \begin{cases} 4x - 1 & \text{for} \quad x > 4 \\ x^2 - 2 & \text{for} \quad -2 \leq x < 4 \\ 3x + 4 & \text{for} \quad x < -2 \end{cases}$

find $f(5) + f(0) + f(-5)$

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20. What is the fundamental difference between a function and a relation ? Let $X = \{1, 2, 3, 4\}$ and $Y = \{1, 5, 9, 11, 15, 16\}$. Determine which of the following sets are :

(i) relation (ii) function (iii) neither

A. $f_1 = \{(x, y): y = x^2, x \in X, y \in Y\}$

B. $f_2 = \{(1, 1), (2, 11), (3, 1), (4, 15)\}$

C. $f_3 = \{(1, 5), (2, 9), (3, 1), (4, 5), (2, 11)\}$

D. $f_4 = \{(1, 1), (2, 7), (3, 5)\}$

Answer:

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21. A certain jet plane has an average speed of 500 km per hour. It can carry sufficient fuel for a 5 hour flight.

Define the relation, as a set, between the distance d (in km) and time t (in hours) for this plane.

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22. A certain jet plane has an average speed of 500 km per hour. It can carry sufficient fuel for a 5 hour flight.

State the range of this relation.

Watch Video Solution

23. A certain jet plane has an average speed of 500 km per hour. It can carry sufficient fuel for a 5 hour flight.

State the range of this relation.

Watch Video Solution

24. A certain jet plane has an average speed of 500 km per hour. It can carry sufficient fuel for a 5 hour flight.

Is this relation a function?

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25. The domain of a function is the set of positive integers less than 12. If $y = f(x) = |x - 4|$, find all ordered pairs satisfying the function. Graph the function.

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26. Let $X = \{2, 3\}$ and $Y = \{1, 3, 5\}$. How many diferent functions are there from X to Y?

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Exercise 2 D

1. A function f given as $f: \{(2, 7), (3, 4), (7, 9), (-1, 6), (0, 2), (5, 3)\}$. Is this function one-one onto?

Interchange the order of the elements in the ordered pairs and form the new relation. Is this relation a function? If it is a function, is it one-one onto.

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2. Determine if each function is one-one.

To each person on the earth assign the number which corresponds to his age.

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3. Determine if each function is one-one.

To each country in the world assign the latitude and longitude of its capital.

Watch Video Solution

4. Determine if each function is one-one.

To each country in the world assign the latitude and longitude of its capital.

Watch Video Solution

5. Determine if each function is one-one.

To each country in the world which has a prime minister assign its prime minister.

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6. Let $f: A \to B$. Find f(A), i.e, the range of f, if f is an onto function.

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7. Show that the function $f: R \to R$ given by $f(x) = \cos x$ for all $x \in R$, is neither one-one nor onto.

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8. Let $A = \{-1, 1\}$. Let functions f, g and h of A be defined by :

(i) f(x)=x (ii) $g(x) = x^3$ (iii) $h(x) = \sin x$.

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9. Given, $A = \{2, 3, 4\}$, $B = \{2, 5, 6, 7\}$. Construct an example of each of the following

(i) an injective mapping from A to B.

(ii) a mapping from A to B which is not injective.

(iii) a mapping from B to A.

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10. Given $A = \{2, 3, 4\}, B = \{2, 5, 6, 7\}$, construct an example of each the following. A mapping from A to B which is not one-one

Watch Video Solution

11. Given, $A = \{2, 3, 4\}, B = \{2, 5, 6, 7\}$. Construct an example of each of the following

(i) an injective mapping from A to B.

(ii) a mapping from A to B which is not injective.

(iii) a mapping from B to A.

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12. Are the following sets of ordered pairs functions? If so, examine whether the mapping is onto or one-one.

$\{(x, y), : x \text{ is a person, y is the mother of x}\}$

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13. Are the following set of ordered pairs functions? If so, examine whether the mapping is injective or surjective:(i) $\{(x,\ y) : x$ is a person, y is the mother of $x\}$ (ii) $\{(a,\ b) : a$ is a person, b is an ancestor of $a\}$

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14. The function $f : N \overrightarrow{N}\ (N$ is the set of natural numbers) defined by $f(n) = 2n + 3is$ (a) surjective only (b) injective only (c) bijective (d) none of these

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15. Let $A = \{x = 0 \leq x \leq 2\}$ and $B = \{1\}$. Give an example of a function from A to B. Can you define a function from B and A which is onto? Give reasons for your answer.

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16. Prove that the function $f: R \to R$, $f(x) = x^2 + x$ is a many-one into function.

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17. Let $A = \{1, 2, 3\}$, $B = 4, 5, 6, 7\}$ and let $f = \{(1, 4), (2, 5), (3, 6)\}$ be a function from A to B. Show that f is one - one but not onto.

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18. Show that the function $f: R \to R: f(x) = 3 - 4x$ is one-one onto and hence bijective.

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Exercise 2 E

1. If the function $f: N \to N$ is defined by $f(x) = \sqrt{x}$, then find $\frac{f(25)}{f(16) + f(1)}$.

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2. If $f(x) = \frac{x^2}{2} - \frac{x^2}{2} + x - 16$, find $f\left(\frac{1}{2}\right)$

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3. If $f(x) = 7x^4 - 2x^3 - 8x - 5$ find f(-1)

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4. If $f(x) = \begin{cases} 3x - 1 & \text{when } x \leq 0 \\ x + 1 & \text{when } x > 0 \end{cases}$, find f(-1) and f(0).

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5. If $f(x) = \log\left(\frac{1-x}{1+x}\right)$, show that $f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right)$

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6. If $f(x) = 2x\sqrt{1-x^2}$, then show that $f\left(\sin\frac{x}{2}\right) = \sin x$.

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7. If $f(x) = \cos(\log x)$, then prove that

$$f\left(\frac{1}{x}\right).f\left(\frac{1}{y}\right) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right] = 0$$

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8. If $y = f(x) = \frac{5x+3}{4x-5}$, then show that f(y)=x.

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9. If $f(x) = x^2 + kx + 1$, for all x and if it is an even function, find k.

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10. $f(x) = x^3 - (k-2)x^2 + 2x$, for all x and if it is an odd function, find k.

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11. Is there a function f which is both even and odd?

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

(a) an even function

(b) an odd function

(c) a periodic function

(d) Neither an even nor an odd function.

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13. Prove that $f(x) = (1/x)\log\sqrt{x + \sqrt{x^2 + 1}}$ is an even function.

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Exercise 2 F

1. The range and domain of function $f(x) = \frac{3}{x} + 1$ are subsets of A and B respectively, where

$A - \left\{ -\frac{1}{2}, 0, \frac{2}{3}, \frac{6}{7}, 1 \right\}$ and $B = \left\{ -5, 0, 4\frac{1}{2}, 5, 5\frac{1}{2} \right\}$. List the elements of the function as ordered pairs.

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2. $A = \{-2, -1, 1, 2\}$ and $f = \left\{ \left(x, \frac{1}{x} \right), x \in A \right\}$

List the range of f

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3. $A = \{-2, -1, 1, 2\}$ and $f = \left\{ \left(x, \frac{1}{x} \right), x \in A \right\}$

List the range of f

Watch Video Solution

4. $A = \{-2, -1, 1, 2\}$ and $f = \left\{ \left(x, \frac{1}{x} \right), x \in A \right\}$

Is f a function?

Watch Video Solution

Watch Video Solution

5. $f: x \rightarrow$ highest prime factor of x.

Find the range of f when the domain is $\{12, 13, 14, 15, 16, 17\}$.

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6. $f: x \rightarrow$ highest prime factor of x.

State a domain of five integers for which the range is (3).

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7. $f: x \rightarrow$ highest prime factor of x.

A set of positive integers is called S. What can be said about these integers if (f)(S)=S?

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8. A function f is defined on the set of real numbers as follows :

$$f(x) = \begin{cases} 1+x & 1 \le x < 2 \\ 2x-1 & 2 \le x < 4 \\ 3x-5 & 4 \le x < 6 \end{cases}$$

(i) Find the domain of the function.

(ii) Find the range of the function.

(iii) Find f(4).

(iv) Is the function one-one ? Justify.

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(i) Find the domain of the function.

(ii) Find the range of the function.

(iii) Find f(4).

(iv) Is the function one-one ? Justify.

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11. Let f be a function whose domain is the set of all real number. If $f(x) = |x| - x$, what is the range of f?

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12. Write the domain of the following real functions

$\sqrt{9-x^2}$

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13. Write the domain of the following real functions

$\sqrt{1-2x-3x^2}$

Watch Video Solution

14. Write the domain of the following real functions

10^x

Watch Video Solution

15. Write the domain of the following real functions

$\frac{1}{\sqrt{x^2-7}}$

Watch Video Solution

16. Write the domain of the following real functions

$\log(2-3x)$

Watch Video Solution

17. Write the domain of the following real functions

$\log\left(\sqrt{x-4}+\sqrt{6-x}\right)$

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18. The domain of the function $f(x)=\left[\log_{10}\left(\frac{5x-x^2}{4}\right)\right]^{1/2}$ is

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19. Write the domain of the following real functions

$\sin^{-1}\left[\log_2\left(\frac{x}{2}\right)\right]$

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20. Find the range of the function

$|x - 3|$

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21. Find the domain and range of each of the following functions

$\sqrt{x - 5}$

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22. Find the range of each of the following functions

$\cos\left(\frac{x}{3}\right)$

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23. Find the range of function

$$\frac{x+1}{|x+2|}$$

Watch Video Solution

24. Find the range of each of the following functions

$$\sec\left(\frac{\pi}{4}\cos^2 x\right), \infty < x < \infty$$

Watch Video Solution

25. Find the range of each of the following functions

$$\frac{x^2+x+2}{x^2+x+1}$$

Watch Video Solution

26. Find the range of the following functions.

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

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27. Find the range of each of the following functions: $f(x) = \frac{1}{\sqrt{x-5}}$ (ii) $f(x) = \sqrt{6-x^2}$ (iii) $f(x) = \frac{x}{1-x^2}$ (iv) $f(x) = \frac{3}{2-x^2}$

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28. Find the domain and range of the function $\frac{x^2-4}{x-2}$

Watch Video Solution

29. If the domain of the function $f(x) = \frac{|x|}{x}$ be $[3, 7]$ then its range is

A. [-1,1]

B. [-1,1]

C. {1}

D. $\{-1\}$

Answer: C

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Exercise 2 G

1. Draw the graph of function. $y = \frac{1}{|x|}$

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2. draw the graph of function. $y = \frac{|x| - x}{2}$

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3. Draw the graph of function. $y = \frac{1}{|x|}$

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4. Draw the graph of function. $y = |4 - x^2|, \ -3 \leq x \leq 3.$

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5. Graph each function. $y = |x| + x, \ -2 \leq x \leq 2$

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6. Graph function. $y = |x + 2| + x$

Watch Video Solution

7. Copy and complete this table of values :

x	-2	-1	0	1	2	3
3^x	0.1	0.3	1			

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8. Draw the graph $y = 3^x$ on squared paper, for $-2 \leq x \leq 3$.

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9. What features do the graphs of $y = 2^x$ and $y = 3^x$ have in common?

Watch Video Solution

10. Draw the graphs $y = 2^x$ and $y = \left(\frac{1}{2}\right)^x$, on the same diagram, for $-3 \leq x \leq 3$

Watch Video Solution

11. In the graph of $y = 2^x$ and $y = \left(\frac{1}{2}\right)^x$ Which line is the axis of symmetry in the diagram?

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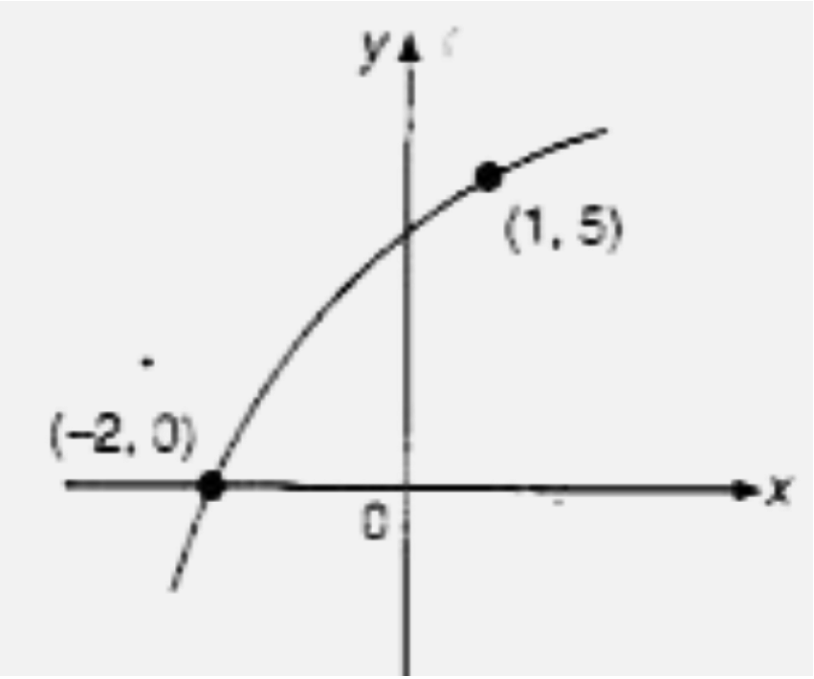
12. A sketch of the graph $y = a\log_4(x + b)$ is shown. Find the values of a and b.



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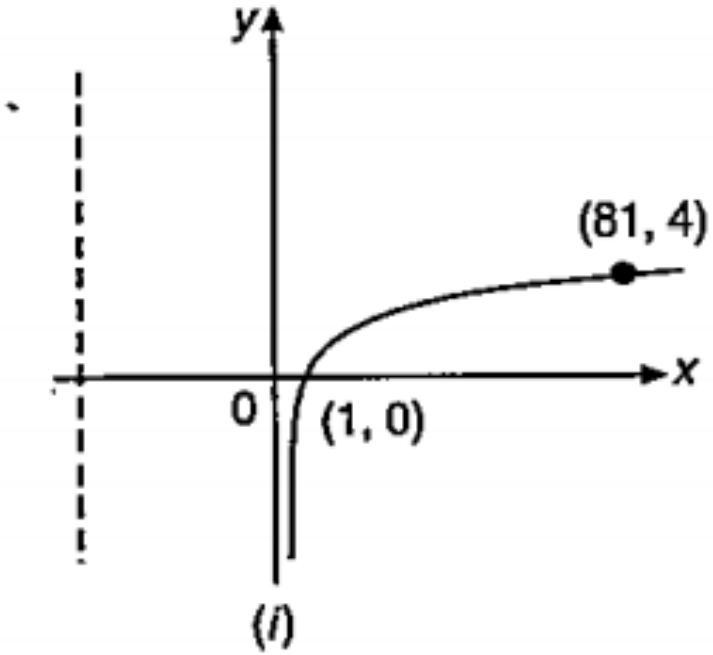
13. Diagram (i) shows the curve $y = \log_a x$. What is the value of a?



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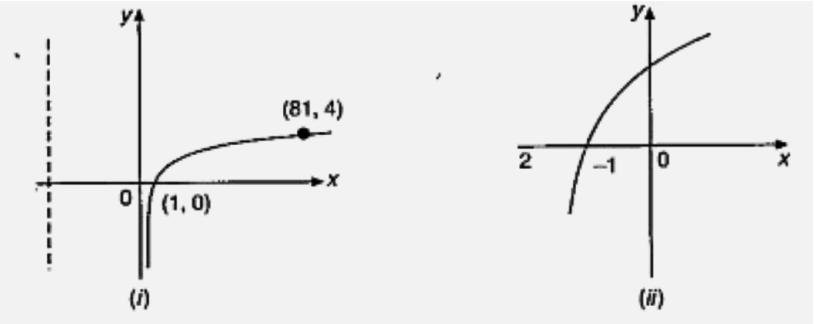
14. Diagram (ii) shows the curve $y = \log_{10}(x + p)$. What is the value of p?



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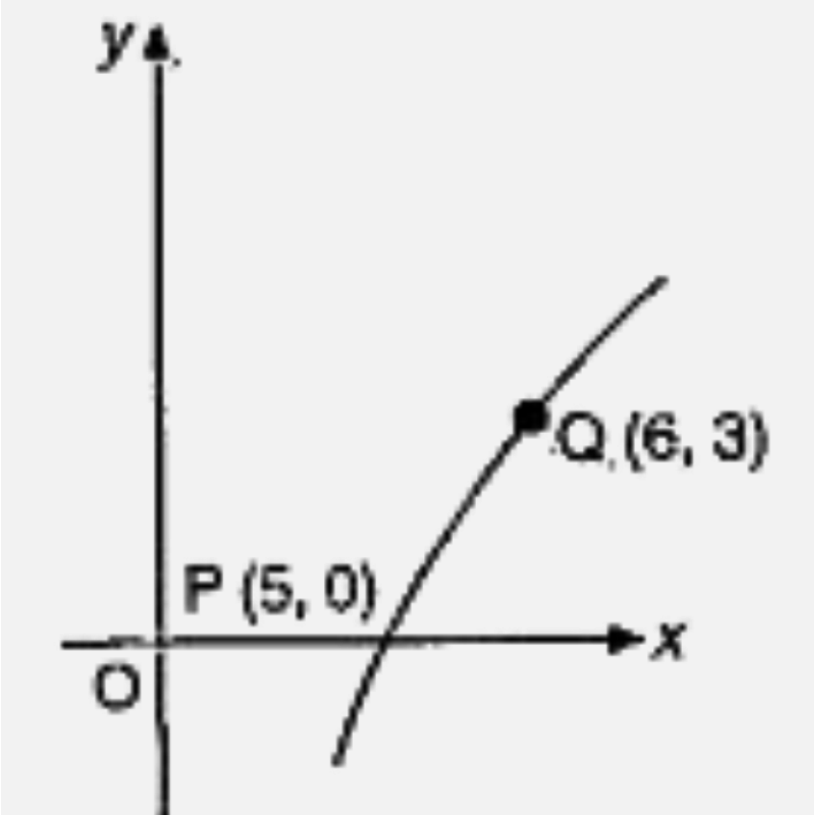
15. Sketch the graphs y=2 and $y = \log_{10} 2x$ on the same diagram.

Watch Video Solution

16. Find the point of intersection of the graphs by solving the equation $\log_{10} 2x = 2$

Watch Video Solution

17. The sketch shows part of the graph $y = a \log_2(x - b)$. Find the values of a and b.



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18. Sketch the graphs y=4-x and $y = \log_{10} x$ on the same diagram.

Watch Video Solution

19. (i)sketch the graph y=4-x and $y = \log_{10} x$ on same graph .

(ii) write down the equation to find the x-coordinate of the point of intersection of graphs

Watch Video Solution

20. Sketch the graphs y=4-x and $y = \log_{10} x$ on the same diagram.

Watch Video Solution

21. Sketch the graphs y=4-x and $y = \log_{10} x$ on the same diagram.

Watch Video Solution

22. Sketch the graphs. $y = \log_2 x$

Watch Video Solution

23. Sketch the graphs. $y = \log_2 x + 1$

Watch Video Solution

24. Sketch the graphs. $y = \log_2(x + 1)$

Watch Video Solution

25. Sketch the graphs. $\log_4 x$

Watch Video Solution

26. Sketch the graphs. $2 \log_4 x$

Watch Video Solution

27. Sketch the graphs. $3 \log_4 x$

Watch Video Solution

28. For $-2 < x < 1$, draw the graph of $y = 2^x$ (use 1 cm =1 unit on both axes). Use this graph to solve $2^x = 2x$.

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29. Complete the following table for $y = 4^x$. Enter the values of x and y correct to 1 decimal place...

x	−2	−1	...	0.5	0.75
y	...	...	1	...	...

Coyp the table on your answer book and enter the vaiues there.

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30. Taking 4 cm =1 unit on both axes, draw the graph of $y = 4^x$ for $0.75 \geq x \geq -2$

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31. From your graph estimate $\log_4 1.25$

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32. Copy and complete the table for the function $y = \frac{3}{x}$, given your answer correct to 1 d.p. Then draw the graph.

x	−3	−2.5	−2	−1.5	−1	−0.5	0.5	1	1.5	2	2.5	3
y	−1	−1.2	...	...	−3	...	6	...	...	1.5	...	...

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33. Sketch the graph of the following rational functions

$$y = \frac{x+3}{x-2}$$

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34. Sketch the graph of the following rational functions

$$y = \frac{6}{x - 6}$$

Watch Video Solution

35. Sketch the graph of the following rational functions

$$y = \frac{6}{x - 6}$$

Watch Video Solution

36. Sketch the graph of the following rational functions

$$y = \frac{2x + 1}{x - 3}$$

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37. Sketch the graph of the following rational functions

$$y = \frac{7 - 2x}{3x + 5}$$

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