



# MATHS

## BOOKS - JBD PUBLICATION

### RELATIONS AND FUNCTIONS

#### Exercise

1. Domain and range of  $f(x) = x^2$  are:

A. Domain R, Range R

B.  $\text{Doma} \in R^+, \text{Range } R$

C.  $\text{Domain } R, \text{Ran} \geq R^+$

D.  $\text{Doma} \in R^+, \text{Ran} \geq R^+$

**Answer:**



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2. If  $f(x) = \sqrt{x}$  and  $g(x)=x$  be two functions defined over the set of non negative real numbers, then  $(fg)(x)$  is:

A.  $x^{\frac{3}{2}}$

B.  $x^{\frac{1}{2}}$

C.  $x$

D.  $x^{-\frac{1}{2}}$

**Answer:**



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**3. If  $(3x, x-y)=(3,4)$ , then the values of  $x$  and  $y$  are:**

A.  $(1,3)$

B.  $(1,-3)$

C.  $(-1,3)$

D.  $(-1, -3)$

**Answer:**



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4. If the set  $A$  has  $p$  elements,  $B$  has  $q$  elements, then the number of elements in  $A \times B$  is:

A.  $p+q$

B.  $p+q+1$

C.  $p \times q$

D.  $p^2$

**Answer:**



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**5. Range of  $f(x) = x^2 + 2$ ,  $x$  is real number is:**

A.  $[2, \infty)$

B.  $(2, \infty)$

C.  $(-2, \infty]$

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

**Answer:**



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6. If  $A=\{1,2,3\}$ ,  $B=[a,b,c]$ , then  $n(A \times B)$  is equal to:

A. 6

B. 9

C. 3

D. 0

**Answer:**



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7. Let  $A$  be a set containing 10 distinct elements.

Then the total number of distinct functions from  $A$  to  $A$  is:

A. 10

B.  $10^{10}$

C.  $2^{10}$

D.  $10^2 - 1$

**Answer:**



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**8.** Let  $A=\{a,b,c,d\}$  and  $B=\{1,2,3\}$ , which of the following relations from A to B is not a function?

A.  $\{(1,1),(b,1),(a,2),(d,3)\}$

B.  $\{(a,1),(b,2),(c,1),(d,2)\}$

C.  $\{(a,1),(b,3),(c,2),(d,2)\}$



D.  $\{(a,1),(b,1),(c,1),(d,1)\}$

**Answer:**



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9. If  $f(x)=ax+b$ , where  $a$  and  $b$  are integers  $f(-1)=-7$  and  $f(2)=8$  then  $a$  and  $b$  are equal to:

A.  $-5$  and  $2$

B.  $5$  and  $-2$

C.  $5$  and  $0$

D. 0 and -2

**Answer:**



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10. If  $f(x) = \frac{2^x + 2^{-x}}{2}$ , then  $f(x+y) - f(x-y)$  is equal to:

A.  $\frac{1}{2}[f(2x) + f(2y)]$

B.  $\frac{1}{2}[f(2x) - f(2y)]$

C.  $\frac{1}{3}[f(2x) + f(2y)]$

D.  $\frac{1}{3}[f(2x) - f(2y)]$

**Answer:**



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11. If  $x \neq 1$  and  $f(x) = \frac{x+1}{x-1}$  is a real function, then  $f(f(f(2)))$  is

A. 1

B. 2

C. 3

D. 4

**Answer:**



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**12.** Domain of  $\sqrt{a^2 - x^2}$  ( $a > 0$ ) is:

A.  $(-a, 0)$

B.  $[-a, a]$

C.  $[0, a]$

D.  $(-a, 0]$

**Answer:**



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13. The range of the function  $f(x) = \frac{x^2 - x}{x^2 + 2x}$  is:

A.  $\mathbb{R}$

B.  $\mathbb{R} - \{1\}$

C.  $\mathbb{R} - \left\{ \frac{1}{2}, 1 \right\}$

D. none of these

**Answer:**



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**14.** Fill in the Blanks Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by

$$f(x) = \frac{1}{2 + \cos x} \quad x \in \mathbb{R} \text{ then range of } f \text{ is .....}$$

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

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

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

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

**Answer:**



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**15. Range of function  $f(x)=1+3\cos 2x$  is:**

A.  $(-2,4)$

B.  $[-2,4)$

C.  $[-2,4]$

D.  $(-2,4]$

**Answer:**



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16. Domian of  $f(x) = \frac{1}{\sqrt{x + |x|}}$  is

A.  $[0, \infty)$

B.  $(0, \infty)$

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

D.  $(-\infty, 0)$

**Answer:**

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17. The range of the real function defined by

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

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

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

C.  $\{-1\}$

D.  $(-1, 1)$

**Answer:**



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18. The range of the function  $f(x) = \frac{x + 2}{|x + 2|}$ ,

$x \neq -2$  is:

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

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

C.  $\{1\}$

D.  $(0, \text{infinity})$

**Answer:**



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**19.** If  $r$  is a relation on a finite set having  $n$  elements, then the number of relation on  $A$  is

A.  $2^n$

B.  $2^{n^2}$

C.  $n^2$

D.  $n^n$

**Answer:**



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20. The range of the function  $f(x)=|x-1|$  is:

A.  $(-\infty, 0)$

B.  $[0, \infty)$

C.  $(0, \infty)$

D.  $\mathbb{R}$

**Answer:**



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21. Let  $R$  be a relation from a set  $A$  to a set  $B$ , then:

A.  $R = A \cup B$

B.  $R = A \cap B$

C.  $R \leq A \times B$

D.  $R \leq B \times A$

**Answer:**



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22. The number of relations that can be defined on the set  $\{x,y,z\}$  is:

A. 9

B.  $2^9$

C.  $2^9 - 1$

D.  $2^3 - 1$

**Answer:**



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23. If  $R = \{(x, y) : x, y \in \mathbb{Z}, x^2 + y^2 \leq 9\}$  is a relation on  $\mathbb{Z}$ , then domain of  $R$  is:

A.  $\{0, 1, 2, 3\}$

B.  $\{0, -1, -2, -3\}$

C.  $\{-3, -2, -1, 0, 1, 2, 3\}$

D. none of these

**Answer:**



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24. The range of the function  $f(x) = \frac{1 + x^2}{x^2}$  is given by:

A.  $(1, \infty)$

B.  $[1, \infty)$

C.  $[0, \infty)$

D. none of these

**Answer:**



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**25.** A vertical line meets the graph of a function in:

- A. infinitely many points
- B. more than one point
- C. not more than one point
- D. none of these

**Answer:**



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26. Find the domain of the function

$$f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}.$$

A.  $\mathbb{R} - \{-3, 2\}$

B.  $\mathbb{R} - \{3, -2\}$

C.  $\mathbb{R} - \{-3, -2\}$

D.  $\mathbb{R} - \{2, 3\}$

**Answer:**



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27. If  $f(x) = 4x - x^2$  for all  $x \in R$ , then the value of  $f(a+1)-f(a-1)$  is:

A.  $2(2-a)$

B.  $3(2-a)$

C.  $4(2-a)$

D.  $3(a-1)$

**Answer:**



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28. If  $f(x)=x-[x]$ , where  $[x]$  is the greatest integer less than or equal to  $x$ , then  $f\left(+\frac{1}{2}\right)$  is:

A. 1

B. 0

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

D.  $\frac{3}{2}$

**Answer:**



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29. If  $f(x) = \log\left(\frac{1+x}{1-x}\right)$ , then  $f\left(\frac{2x}{1+x^2}\right)$  equal to:

A.  $3f(x)$

B.  $2f(x)$

C.  $\frac{2}{3}f(x)$

D.  $\frac{2f(x) + 1}{f(x) + 2}$

**Answer:**



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## Example

1. Let  $A=\{1,2,3\}$ ,  $B=\{2,3,4\}$  and  $C=\{4,5,6\}$ . verify that:

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



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2. Let  $A=\{1,2,3\}$ ,  $B=\{2,3,4\}$  and  $C=\{4,5\}$ . verify that:

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



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3. Let  $A=\{1,2,3\}$ ,  $B=\{2,3,4\}$  and  $C=\{4,5\}$ .n verify that:

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



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4. Let  $A=\{2,3\}$ ,  $B=\{1,2,3,4\}$ . Verify that

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



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5. Find the domain of the function:

$$f(x) = \frac{x^2 - 3x + 2}{x^2 + x - 6}$$

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

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7. Find the range of the following functions:

$$f(x) = 1 + 3 \cos 2x$$

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**8.** Find the range of the following functions:

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



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**9.** Find the range of the following functions:

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



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**10.** Find the domain and range of the following real function:-  $f(x) = -|x|$



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**11.** Find the domain and range of the following functions:

$$f(x) = \sqrt{16 - x^2}$$



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**12.** Find the domain and range of the following functions:

$$f(x) = \sqrt{x - 3}$$



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**13.** Find the domain and range of the following functions:

$$f(x) = |x - 3|$$



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**14.** If  $f(x) = \frac{x - 1}{x + 1}$ , then show that

$$f\left(\frac{1}{x}\right) = -f(x)$$



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15. If  $f(x) = \frac{x-1}{x+1}$ , then show that

$$f\left(-\frac{1}{x}\right) = -\frac{1}{f(x)}.$$



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16. Domian of  $f(x) = \frac{1}{\sqrt{x+|x|}}$  is



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17. Find the domain of each of the following functions:

$$x|x|$$

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**18.** Find the domain of each of the following functions:

$$\frac{x^3 - x + 3}{x^2 - 1}$$

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**19.** Find the domain of  $f(x) = \frac{1}{\sqrt{1 - \cos x}}$

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**20.** Find the range of  $f(x)=1-|x-2|$ .



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

$\{(2, 1), (5, 1), (8, 1), (11, 1), (14, 1), (17, 1)\}$



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

$\{(2, 1), (4, 2), (6, 3), (8, 4), (10, 5), (12, 6), (14, 7)\}$



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23. Which of the following relations are functions? Give reasons, if it is a function, determine its domain and range

$\{(0,0),(1,1),(1,-1),(4,2),(4,-2),(9,3),(9,-3),(16,4),(16,-4)\}$



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**24.** Which of the following relations are functions? Give reasons, if it is a function, determine its domain and range

$$\{(1,2),(1,3),(2,5)\}$$



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**25.** Which of the following relations are functions? Give reasons, if it is a function, determine its domain and range

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





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**26.** Let  $A=\{2,3,4,5\}$ , which of the following relations from  $A$  into  $A$  is a function? If function, determine the domain and range.

$\{(2,2),(3,2),(4,2),(5,2)\}$



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**27.** Let  $A=\{2,3,4,5\}$ , which of the following relations from  $A$  into  $A$  is a function? If function,

determine the domain and range.

$$\{(2,3),(3,4),(4,5),(3,5)\}$$



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**28.** Let  $A=\{2,3,4,5\}$ , which of the following relations from  $A$  into  $A$  is a function? If function, determine the domain and range.

$$\{(2,3),(3,4),(4,5),(3,5)\}$$



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29. Let  $A=\{2,3,4,5\}$ , which of the following relations from  $A$  into  $A$  is a function? If function, determine the domain and range.

$\{(2,2),(3,2),(4,2),(5,2)\}$



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30. Let  $A=\{2,3,4,5\}$ , which of the following relations from  $A$  into  $A$  is a function? If function, determine the domain and range.

$\{(2,3),(2,4),(2,5)\}$



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**31.** Find the range of the following function:-

$$f(x) = 2 - 3x, x \in R, x > 0.$$



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**32.** Find the range of the following function:-

$$f(x) = x^2 + 2, x \text{ is a real number.}$$



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**33.** Find the range of the following functions:

$$f(x) = x^2 - 4x + 6, x \in R$$



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**34.** Find the range of the following functions:

$$f(x) = \frac{5}{x - 3}, x \in R$$



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**35.** Find the range of the following functions:

$$f(x) = \frac{1}{2}x, x \in R$$



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