

Chapter: - Three Dimensional Geometry, Relations and functions

Q1. (i) If $(x-y, 3) = (5, x+y)$ then find the value of x and y . **Ans.** 4, -1,

(ii) If $(x+3, 5) = (6, 2x+y)$ then find the value of x and y . **Ans.** 3, -1,

(iii) If $(x-1, y+3) = (2, -5)$ then find the value of x and y . **Ans.** 3, -8,

Q2. If $n(A) = p$, $n(B) = q$, $n(C) = r$ and $n(D) = s$ then find (i) $n(A \times B \times C \times D)$ (ii) Number of possible subset of $(A \times B \times C \times D)$ (iii) $n[P(A \times B \times C \times D)]$ (iv) Number of possible relation from A to C (v) Number of possible relation from B to D **Ans.** $pqr s$, $2^{pqr s}$, $2^{pqr s}$, 2^{pr} , 2^{qs} ,

Q3. If $A = \{1, 2, 3\}$, $B = \{3, 4\}$ and $C = \{1, 3, 5\}$, find (i) $A \times (B \cup C)$ (ii) $A \times (B \cap C)$ (iii) $(A \times B) \cap (B \times C)$, **Ans.** (i) $\{(1, 1), (1, 3), (1, 4), (1, 5), (2, 1), (2, 3), (2, 4), (2, 5), (3, 1), (3, 3), (3, 4), (3, 5)\}$ (ii) $\{(1, 3), (2, 3), (3, 3)\}$ (iii) $\{(3, 3)\}$

Q4. A relation R is defined from a set $A = \{2, 3, 4, 5\}$ to a set $B = \{3, 6, 7, 10\}$ as follows $\{(x, y) : x \text{ divides } y\}$. Express R as a set of ordered pairs and determine the domain and range of R . **Ans.** $\{(2, 6), (2, 10), (3, 3), (3, 6), (5, 10)\}$, $\{2, 3, 5\}$, $\{3, 6, 10\}$.

Q5. Find the domain and range of following functions:-

(i). $f(x) = \sqrt{x^2 - 4}$, **Ans.** $(-\infty, 2] \cup [2, \infty)$, $[0, \infty)$,

(ii). $f(x) = \frac{1}{\sqrt{9 - x^2}}$, **Ans.** $(-3, 3)$, $[1/3, \infty)$,

(iii). $f(x) = \sqrt{1 - x^2}$, **Ans.** $(-1, 1)$, $[0, 1]$,

(iv). $f(x) = 4 \sin x - 3 \cos x$, **Ans.** Real Numbers, $[-5, 5]$,

(v). $f(x) = 1 + 3 \cos 2x$, **Ans.** Real Numbers, $[-2, 4]$,

(vi). $f(x) = |x - 3|$, **Ans.** Real Numbers, $[0, \infty)$,

(vii). $f(x) = \frac{x^2}{x^2 + 1}$, **Ans.** Real Numbers, $[0, 1)$,

(viii) $f(x) = 3x + 7$, **Ans.** Real Numbers, Real Numbers,

(ix) $f(x) = x^2 + 1$, **Ans.** Real Numbers, $[1, \infty)$,

(x) $f(x) = \frac{|x - 4|}{x - 4}$, **Ans.** $(-\infty, 4] \cup [4, \infty)$, $\{-1, 1\}$,

(xi) $f(x) = -|x|$, **Ans.** Real Numbers, $(-\infty, 0)$,

(xii) $f(x) = \frac{x - 2}{x + 1}$, **Ans.** $(-\infty, -1) \cup (1, \infty)$, $(-\infty, 1) \cup (1, \infty)$,

Q6. If $A = \{-2, -1, 1, 2\}$ and $f = \{(x, 1/x) : x \in A\}$, find domain and range of f . **Ans.** A , $\{-1/2, -1, 1, 1/2\}$.

Q7. Find the domain for which the function $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal. **Ans.** $\{-1, 4/3\}$

Q8. Let $f(x) = 3x + 4 \forall x \in \mathbb{R}$. If ordered pairs $(a, 8)$ and $(2, b)$ belongs to f . Find a and b . **Ans.** $4/3$, 10 ,

Q9. Draw the graph of each of following functions is given by:-

(i) $f(x) = 1/x, x \neq 0$

(ii) $f(x) = x|x|$

(iii) $f(x) = |x-2| + |x-3|$,

(iv) $f(x) = \sqrt{9-x^2}$,

(v) $f(x) = x - [x]$,

(vi) $f(x) = |x|$,

Q10. If $A = \{a, b, c\}$, $B = \{d\}$ and $C = \{e\}$. Verify the following:-

(i). $A \times (B \cup C) = (A \times B) \cup (A \times C)$, (ii) $A \cup (B \times C) = (A \times C) \cup (A \times B)$,

Q11. Determine the domain and the range of the relation R defined by $R = \{(x+1, x+5): x \in \{0, 1, 2, 3, 4, 5\}\}$,

Ans. $\{1, 2, 3, 4, 5, 6\}$, $\{5, 6, 7, 8, 9, 10\}$.

Q12. Is $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ a function? If this is described by the formula $g(x) = ax + b$ then what values should be assigned to a and b? **Ans.** Yes, 2, -1

Q13. If R is the relation 'is greater than' from $A = \{2, 3, 4, 5, 6\}$ to $B = \{2, 5, 6\}$. Write R in tabular form, its domain and range. **Ans.** $\{(3, 2), (4, 2), (5, 2), (6, 2), (6, 5)\}$, $\{3, 4, 5, 6\}$ $\{2, 5\}$.

Q14. Given $A = \{-1, 0, 2, 5, 6, 11\}$, $B = \{-2, -1, 0, 18, 28, 108\}$ and $f(x) = x^2 - x - 2$. Find $f(A)$. Is $f(A) = B$?

Ans. $\{0, -2, 18, 28, 108\}$. No.

Q15. Show that the points $(-2, 6, -2)$, $(0, 4, -1)$, $(-2, 3, 1)$ and $(-4, 5, 0)$ are vertices of the square.

Q16. Find the ratio in which the line segment joining the points $(2, 4, -3)$ and $(-3, 5, 4)$ is divided by (i) the xy-plane (ii) the plane $x+y+z=8$. **Ans.** 3:4 internally, 5:2 externally

Q17. Show that the three points A $(1, -2, -8)$, B $(5, 0, -2)$ and C $(11, 3, 7)$ are collinear. Find the ratio in which B divides AC. **Ans.** 2:3

Q18. A is a point $(1, 3, 4)$ and B is the point $(1, -2, -1)$. A point P moves so that $3PA = 2PB$. Find the locus of P. **Ans.** $5x^2 + 5y^2 + 5z^2 - 10x - 70y - 80z + 210 = 0$.

Q19. Show that the points A $(0, 1, 2)$, B $(2, -1, 3)$ and C $(1, -3, 1)$ are vertices of an isosceles right angled triangle.

Q20. Show that the points A $(1, 3, 4)$, B $(-1, 6, 10)$ and C $(-7, 4, 7)$ and $(-5, 1, 1)$ are the vertices of a rhombus.

Q21. Find the point on z-axis which is equidistant from $(1, 5, 7)$ and $(5, 1, -4)$. **Ans.** $(0, 0, 3/2)$.

Q22. Find the value of p such that distance between the points $(4, 5, p)$ and $(7, 1, -3)$ is 13. **Ans.** -15 or 9.

Q23. Three vertices of a parallelogram ABCD are A $(3, 4, 6)$, B $(-1, 0, 6)$ and C $(5, 2, 0)$. Find the coordinate of D. **Ans.** $(9, 6, 0)$.

Q24. Find the distance of the point $(1, 2, 0)$ from the point where line joining A $(2, -3, 1)$ and B $(3, -4, -5)$ cuts the plane $2x + y + z = 7$. **Ans.** $\frac{\sqrt{281}}{3}$.

Q25. The mid points of the sides of the triangle are $(1, 5, -1)$, $(0, 4, -2)$ and $(2, 3, 4)$. Find its vertices. **Ans.** $(1, 2, 3)$, $(3, 4, 5)$ and $(-1, 6, -7)$.

Q26. Determine the point in xy-plane which is equidistant from three points A $(2, 0, 3)$, B $(0, 3, 2)$ and C $(0, 0, 1)$. **Ans.** $(3, 2, 0)$.

-----**Best of Luck**-----

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