

Followings are of 2 Marks each (Q01-05).

Q01. If $M = \{x : x = a + 1, -2 < a < 3, a \in \mathbb{Z}^+\}$, then find $M \times M \times M$.

OR

Let A and B be two sets such that $n(A) = 3$ and $n(B) = 2$. If $(p, 1)$, $(q, 2)$ and $(r, 1)$ are in $A \times B$ then, find the sets A and B, where p, q and r are distinct elements. Also write the set of remaining elements of $A \times B$.

Q02. If $(x + 2y, 3x) = (-28, y)$ then, find the value of x and y. Hence write the value of $(-x)^{\frac{y}{3}}$.

Q03. Let $f = \{(1, 3), (2, 4), (3, 5), (4, 6)\}$ be a linear function given by $f(x) = ax + b$, for some real numbers 'a' and 'b'. Determine the value of a and b. Hence write the function $f(x)$.

Q04. Sketch the graph of greatest integer function, $f(x) = [x]$ and write its domain and range.

Q05. Let $A = \{x : x \text{ is the name of month in a non leap year}\}$, $B = \{28, 29, 30, 31\}$.

Let $R : A \rightarrow B$ is defined by $R = \{(a, b) : \text{'a' month has 'b' number of days}\}$. Write the roster form of this relation. Hence write its range. [2 × 5 = 10]

Followings are of 3 Marks each (Q06-07).

Q06. Let $A = \{1, 2, 3, 4\}$, $B = \{1, 5, 9, 11, 15, 16\}$ and $f = \{(1, 5), (2, 9), (3, 1), (4, 5), (2, 11)\}$.

Are the following true?

(a) f is a relation from A to B.

(b) f is a function from A to B.

Justify your answer in each case.

Q07. If $f(x) = \frac{1-x}{1+x}$, $x \neq -1$, then find the value of $\frac{f(x) \cdot f(x^2)}{1 + [f(x)]^2}$.

OR

Find the domain of $f(x) = \frac{3x^2 + x + 5}{\sqrt{x^2 - 6x - 7}}$. Also show it on the number line. [3 × 2 = 6]

Following is of 4 Marks (Q08).

Q08. **CASE STUDY :** To make herself self-dependent and to earn her living, a college student decided to setup a small scale business of manufacturing hand sanitizers.



She estimated a fixed cost of ₹15000 per month and a cost of ₹30 per unit to manufacture.

Based on the above information, answer the following questions.

(a) Let x units of hand sanitizers are manufactured per month. What is the function of cost?

(b) If each unit is sold for ₹45, then what is the selling (revenue) function?

(c) How many units should be manufactured and sold, for break-even (that is, no profit, no loss situation) in a month?

(d) What is the monthly cost borne by the student, if the student decided to manufacture 1500 units in a month? [1 × 4 = 4]

Followings are of 5 Marks each (Q09-10).

Q09. Let $f = \left\{ \left(x, \frac{x}{1+x^2} \right) : x \in \mathbb{R} \right\}$ be a function from \mathbb{R} into \mathbb{R} . Determine the range of f.

OR

Find the domain of $f(x) = \frac{1}{\sqrt{[x]^2 - 2[x] - 8}}$.

Q10. Redefine the function $f(x) = |x - 1| + |x + 2|$, $-3 \leq x \leq 4$ and hence draw its graph. [5 × 2 = 10]

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O.P. GUPTA

Author & Math Mentor

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📖 The O.P. Gupta Advanced Math Classes
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