

Assignment 1

Course Code (Name) : BM206(Quantitative Techniques)

Section 1: Problems

Course Covered : Sets, Relations, Functions, Limits, Continuity, Differentiation

Instructions : Attempt all questions on your own at the first instance. If you cannot do them on your own, you are free to take help of your batch mates or your course instructor. The assignments need not be submitted but the course instructor reserves the right to ask for the solutions any time.

1. Out of 450 students in a school, 193 students read Science and 200 students read Commerce and 80 students read neither. Find out how many read both?
2. A class has 175 students. The following is the description showing the number of students studying one or more of the following subjects in the class: Mathematics – 100, Physics – 70, Chemistry – 46, Mathematics & Physics – 30, Mathematics & Chemistry – 28, Physics & Chemistry – 18. Find
 - (i) How many students are enrolled in Mathematics alone, Physics alone and Chemistry alone?
 - (ii) The number of students who have not offered any of these three subjects.
3. Prove that in the set of natural numbers, the relation 'x is a multiple of y' is not an equivalence relation.
4. Let \mathbf{N} be the set of all natural numbers. Show that the relation \mathcal{R} on $\mathbf{N} \times \mathbf{N}$, defined by $(a,b) \mathcal{R} (c,d) \Leftrightarrow a + d = b + c \quad \forall (a,b), (c,d) \in \mathbf{N} \times \mathbf{N}$ is an equivalence relation.
5. A company decides to set up a small production plant for manufacturing electronic clocks. The total cost for initial set up is Rs. 900000. The additional cost for producing each clock is Rs. 300. Each clock is sold at Rs. 750. Determine the cost function, the revenue function, the profit function and the break-even point.
6. Let \mathbf{Q} be the set of all rational numbers. Show that the function
$$f: \mathbf{Q} \rightarrow \mathbf{Q} : f(x) = 3x + 5 \quad \forall x \in \mathbf{Q}$$
is one – one onto. Also find a formula that defines f^{-1} .
7. Let \mathbf{R} be the set of all real numbers. Let $f: \mathbf{R} \rightarrow \mathbf{R} : f(x) = \sin x \quad \forall x \in \mathbf{R}$ and $\omega: \mathbf{R} \rightarrow \mathbf{R} : \omega(x) = x^2 \quad \forall x \in \mathbf{R}$. Prove that $f \circ \omega \neq \omega \circ f$.
8. Is $y^2 = x$ a function of x? Give reasons.
9. Find the domain and range of the function $f(x) = \frac{x^2}{1 + x^2}$
10. Find the following limits:
 - (a) $\lim_{x \rightarrow 3} \frac{x^5 - 243}{x^2 - 9}$
 - (b) $\lim_{x \rightarrow \infty} \frac{x^2 + ax + b}{x^2 + px + q}$
11. Show that $\lim_{x \rightarrow \infty} \frac{x}{|x|}$ does not exist.

12. Discuss the continuity of the function $f(x)$ at $x = 0$

$$f(x) = \begin{cases} 3x-2, & \text{when } x \leq 0 \\ x+1, & \text{when } x > 0 \end{cases}$$

13. Let

$$f(x) = \begin{cases} 1, & \text{if } x \leq 3 \\ ax + b, & \text{if } 3 < x < 5 \\ 7, & \text{if } 5 \leq x \end{cases}$$

Find the values of a and b so that $f(x)$ is continuous.

14. If $f(x) = |x|$, show that $f'(2) = 1$.

15. Differentiate the following w.r.t x .

(i) $(2x^2 + 5x - 1)(x - 3)$

(ii) $(x^2 \tan x - x \log x)$

(iii) $\sin x^{\log x}$

(iv) $\frac{e^x}{1 + \sin x}$

Section 2: Think???

Instructions: Think on the questions that are mentioned below. A discussion will be initiated in the class by the course instructor on those where the students will be asked to share their views

1. What is the importance of the term *Quantitative* in Quantitative Techniques?

2. Do you think Quantitative Techniques should be an area of study in Management?