Question 1:- Show that limit(x→0) [xsin(1/x)]=0.

Question 2:-If function f :1R→1R and C belongs to 1R be a cluster point then lim (x f(x) = L if and only if

limx f(x+c) =L .

Question 3:- If f(x) = e^(1/x)—1/e^(1/x)+1 when x ≠0 and f(x)= 0 , when x=0 , then check the function is discontinuous at x=0.

Question 4:-If f(x) = |x| +|x—1|, then check the function is continuous at x=0, x=1.

Question 5:-If lim x^n=c^n , n=0, 1, 2, 3 , 4, 5 ....n then prove that p(x) is polynomial function of x is continuous for all Cbelonf to1R.

Question 6:-Let A contains in 1R , let function f:A→1R and let F(x)≥0 for all x belon to A; we let √f be defined for xeA .

√f(x) = √(f(x))

a.) If f is continuous at ceA, √f is continuous at C .
b.) If f is continuous at A , √f is continuous on A.

Question 7:-Show that every polynomial of odd degree with real co-efficient has at least one real root .

Question 8:-Let f(x)=x^2 , xe1R , Show that f is uniform continuity on every closed and finite interval but it is not uniform continuity on 1R.

Question 9:-Show that f(x)=1/x^2 is uniform continuity on [a,∞) , a >0.

Question 10:-Prove that f(x) = sinx^2 is not uniform continuity on [0,∞).

Question 11:-Give an example to show the function that has right hand limit but not has left hand limit.

Question 12:-Prove that h(x)= [sin x^k]^m, m,ke1N is differentiable.

Question 13:- Define f:1R→1R as f(x) = x^5 +4x +3 .As f is continuous and strictly monotone increasing function , Therefore inverse of f^(-1) that is g exist.

Question 14:-Show that between any two roots of sin(x) = 0 there exist a root of cos(x) = 0 and between any two roots of cos(x) = 0 there exist a root of sin(x) = 0.

Question 15:-Show that between any two roots of e^(x)cos(x)=1 there exist at least one root of e^(x)sin(x)=1 .

Question 13:-Define f:1→

Q 1. Using the mathematical induction prove the following:

a) $\mathrm{Cos}(n\pi) = (-1)^n$

b) $a^{m+n} = a^m\ a^n$,where $a \in R$ and $m , n \in N$

Q 2. Supremum of a set if exists, is unique.

Q 3. Let S be any non-empty subset of R. Then an upper bound u of S is the supremum of S if and only if for every $\varepsilon > 0$ there exists an $s_0 \in S$ such that $u - \varepsilon < s_0$

Q 4. Let A and B are two non-empty bounded subsets of R and let $A + B = \{a + b : a \in A , b \in B\}$ Then

1. sup (A +B) sup (A) +sup (B)
2. inf (A +B) inf (A) +inf (B)

Q 5. Let S be a non-empty bounded subset of R and let a>0 be any real number in R and let $aS = \{ as : s \in S\}$. then prove that 1. Sup (aS) = a sup (S) 2. Inf (aS) = a inf (S)

Q 6. Let S and T be two non-empty subsets of R such that $s \leq t$ for each $s \in S$ and $t \in T$. Then prove that $\sup(S) \leq \inf(T)$

Q 7. Let $S = \{ x \in R : x>1\}$. Show that S has a lower bounds, but has no upper bound. Also find the inf (S).

Q 8. Find the supremum and infimum of the following sets.

1. $S = (0, 1] \cup \{3\}$
2. $S = (3,4) \cup \{2\}$

Q 9. If $x \in R$, then there exists $n_x \in N$ such that x < exists $x < n_x$.

Q 10. The set of natural numbers N is unbounded.

Q 11. If a and b are real numbers with a < b then there exists an irrational number s such that a < s < b.

Q 12. Prove that there exists a positive real numbers u such that $u^2 = 2$.

Q 13 If S is a non-empty subset of R that contains at least two points and has the property if $a,b \in S$, and a b < then $[a, b] \subseteq S$. Then S is an interval.

Q 14. If $x, y \in [a ,b]$. Then show that $|x-y| \leq b-a$

Q 15. If S = [x, y] and T = [a, b] are closed interval in R. Then show that $S \subseteq T$ if and only if

$a \leq x$ and $y \leq b$.

Q 16. Show that the sequence of intervals $[0,,1/n]$ for n $n \in N$ is nested.

Q 17. Let $I_n = [a_n , b_n]$, $n \in N$ is a nested sequence of closed bounded intervals. Then the intersection of all of these intervals is either a closed interval or a single point.

Q 18. Prove that R the set of real numbers is not countable.

Q 19. If S is a non-empty subset of R. Show that S is bounded if and only if there exists a closed bounded interval I such $S \subseteq I$.

Q 20. Every infinite bounded subset of real numbers has a limit point.

Q 21. Give an example of an infinite bounded set which has a limit point.

Q 22. Does there exists an infinite unbounded set having a limit point.

Q 23. A subset A of I is closed if and only if it contain all of its limit points.

Q 24. A non-empty bounded closed subset A of I contains its supremum as well as its infimum.

Q 25. The derived set of any set is always closed.

Q 26. Show that $\lim 1/n = 0$

Q 27. Give examples of sets A and A' such that $A \subset A'$.

Q 28. Show that the set of integers has no limit point.

Q 29. Give an example of a set whose derived set is an infinite bounded set.

Q 30. Show that the sequence (x_n) where $x_n = 1+\frac{1}{3}+\frac{1}{3^2}+ \dots\dots\dots + \frac{1}{3^{n-1}}$ converges. Also find $\lim_{n\to\infty} x_n$.

Q 31. If (x_n) is a convergent sequence of non–negative numbers such that $\lim x_n = x$ then $x \geq 0$.

Q 32. Every convergent sequence is bounded.

Q 33. Show that the sequence $(x_n) = (-1)^n$ does not converge.

Q 34. Prove that the sequence (x_n) where $x_n = 0$ when n is odd and $x_n = 1$ when n is even, does not converge.

Q 35. Show that series 2 - 2 + 2 + ---- oscillates .

Q 36. Show that series $1 + r + r^2 + \text{------}$ $(r > 0)$ converges if $0 < r < 1$ and diverges if $r \geq 1$.