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Limits and Continuity: A Fundamental Concept in Calculus In this chapter, we will delve into the methods of finding limits of normal functions and trigonometric functions, as well as identify whether a given function is continuous or discontinuous at x = a. Before moving on to the solution section, let us revisit some fundamental concepts about limits and continuity. As a review, we give the definition of a function, its domain, range, and graph once again before defining the limit of a function. Limits and continuity are indispensable concepts for developing calculus, as they are closely linked together in the concept of limit. We will begin by discussing the precise definition of the limit, followed by some intuitive examples to provide an idea about it. This approach is similar to our discussion on continuity. We shall also mention some limit theorems and properties of continuous functions without proof. for advanced proficiency, Limit and Continuity Notes on EduRev are your ultimate resource for success. The "Limit and Continuity Grade 11 Questions" guide is a valuabel resourse for all aspiring students preparing for the Grade 11 exam. It focusses on providing a wide range of practice questions to help students gauge ther understanding of the exam topics. These questiones cover the enitre syllabus, ensuring comprehensiv preparation. The guide includes previous years' question papers for students to familiarize themselfs with the exam's format and dificulty level. Additinally, it offers subject-specific question banks, allowing students to focuss on weak areas and improve ther performance. Students of Grade 11 can study Limit and Continuity alongwith tests & analysis from the EduRev app, which will help them while preparing for ther exam. Apart from the Limit and Continuity, students can also utilize the EduRev App for other studymaterials such as previous year question papers, syllabus, imortant questions, etc. The EduRev App will make your learning easier as you can access it from anywere you want. The content of Limit and Continuity is prepared as per the latest Grade 11 syllabus. The paper discusses the definition and evaluation of limits and continuity in functions. Key concepts include methods for determining limits, handling removable singularities, and demonstrating the continuity of various functions at specified points. Examples and problems provide pratical application of theoretical principles, illustrating the underlying mathematics of limits and continuity. Limits and Derivatives Class 11 Maths NCERT Solutions are extremly helpful while doing your homework. NCERT Solutions for Class 11 Maths Chapter 13 Limits and Derivatives All Exercies were prepared by Experienced LearnCBSE.in Teachers. Free download NCERT Solutions for Class 11 Maths Chapter 13 Limits and Derivatives Ex 13.1, Ex 13.2, and Miscellaneous Exercise PDF in Hindi Medium as well as in English Medium for CBSE, Uttarakhand, Bihar, MP Board, Gujarat Board, BIE, Intermediate and UP Board students, who are using NCERT Books based on updated CBSE Syllabus for the session 2019-20. The NCERT Solutions for Class 11 Maths Chapter 13 – Limits and Derivatives is an exhaustive guide that provides solutions to all the exercises in the chapter. The solutions are carefully crafted by experienced educators who have expertise in the subject, ensuring that they are accurate and easy to understand. The chapter has been renumbered as per the CBSE Syllabus 2023-24, making it easier for students to navigate and access the relevant content. The solutions are arranged topic-wise, allowing students to focus on specific areas of interest and build a strong foundation in limits and derivatives. Each exercise is accompanied by detailed solutions that explain every step clearly, helping students to understand the concept and apply it to real-world problems. The exercises range from basic to advanced levels, ensuring that students can practice and reinforce their learning at different stages. In addition to the exercise solutions, there are also answers to miscellaneous questions, which provide further clarification on specific topics and concepts. This comprehensive resource is designed to support students in achieving excellence in their CBSE exams. Derivatives are used in various fields to determine rates of change, and their applications include finding the length of wire, velocity and trajectory of objects, and improving efficiency in operations research. The quantity of units one should sell can be determined by analyzing the data on business performance over the past few months and plotting a curve. The derivative of this graph represents the instantaneous slope, which gives insight into the marginal cost of producing every additional unit at that instant. If the cost exceeds 10 dollars per unit, it's best to reduce the price and avoid incurring losses. In general, if the sales exceed the costs between 400-600 units, it's a profitable venture. However, for the first 300 units, if the costs are higher than the sales, then it's a loss-making situation. ###ARTICLELimits in calculus are crucial for understanding concepts like continuity, derivatives, and integrals. A limit defines how a function behaves as its input gets closer to a specific point. It answers the question: "What value does a function approach as the input gets closer to a certain point?" Students must grasp this concept to understand other topics better. Limits can be approached from either side of a curve, allowing us to find two separate limits, known as Left Hand Limit (LHL) and Right Hand Limit (RHL). If both LHL and RHL exist and are equal, the two-sided limit exists. Infinite limits occur when a function approaches positive or negative infinity as its input approaches a certain point. For example, consider the function f(x) = 1/x^2. As x approaches 0 from either side, f(x) becomes increasingly large (approaches infinity), so the limit of f(x) as x approaches 0 is +∞. This shows how limits can describe the behavior of a function as its input grows without bound. Understanding limits is essential for solving various mathematical problems and is a fundamental concept in calculus. By grasping this concept, students can better comprehend other topics and develop problem-solving skills. The limit of a function as the variable x approaches negative infinity is denoted by limx→−∞f(x) = L. For instance, consider the function f(x) = 1/x. As x grows without bound (either positively or negatively), f(x) approaches 0. Consequently, limx→+∞ 1/x = 0 and limx→−∞ 1/x = 0.The properties of limits are as follows:\(\begin{array}{l}\text{We assume that }\lim\limits_{x \to a}f(x)\text{ and }\lim\limits_{x \to a} g(x) \text{ exist and c is a constant. Then,}\end{array} \)\(\begin{array}{l}\lim\limits_{x \to a} \left [c.f(x) \right]= c \lim\limits_{x \to a}f(x)\end{array} \)\(\begin{array}{l}\lim\limits_{x \to a} \left [f(x)\pm g(x) \right]= \lim\limits_{x \to a}f(x) \pm \lim\limits_{x \to a}g(x)\end{array} \)\(\begin{array}{l}\lim\limits_{x \to a} \left [f(x) .g(x) \right]= \lim\limits_{x \to a}f(x) . \lim\limits_{x \to a}g(x)\end{array} \) \(\begin{array}{l}\large \lim\limits_{x \to a} \left [\frac{f(x)}{g(x)} \right] = \frac{\lim\limits_{x \to a}f(x)}{\lim\limits_{x \to a}g(x)} \text{ provided }\lim\limits_{x \to a}g(x) eq 0\end{array} \)\(\begin{array}{l}\lim\limits_{x \to a} c = c\end{array} \) \(\begin{array}{l}\lim\limits_{x \to a} xn = an\end{array} \) Various rules that are used to simplify the limit of the function are,limx→a (xn – an)/(x – a) = na(n-1)limx→a sin x/x = 1limx→a tan x/x = 1limx→a (1 – cos x)/x = 0limx→a cos x = 1limx→a ex = 1limx→a (ex – 1)/x = 1limx→∞ (1 + 1/x)x = eThe algebra of the limit of the function are added below,Law of Additionlimx→a {f(x) + g(x)} = limx→a f(x) + limx→a g(x)Law of Subtractionlimx→a {f(x) – g(x)} = limx→a f(x) – limx→a g(x)Law of Multiplicationlimx→a {f(x) . g(x)} = limx→a f(x) . limx→a g(x)Law of Divisionlimx→a {f(x) / g(x)} = limx→a f(x) / limx→a g(x)Limit of any function is defined as the value of the function when the independent variable of the function approaches a particular value. A function’s limit exist only when the left hand limit and right hand limit of the function both exist and are equal.Limit of the polynomial function are added below, consider a polynomial function,f(x) = a0 + a1x + a2x2 + … + anHere, a0, a1, … , an are all constants. At any point x = a, the limit of this polynomial function islim x → a f(x) = lim x → a [a0 + a1x + a2x2 + . . . + anxn]= lim x → a a0 + a1lim x → a x + a2lim x → a x2 + . . . + anlim x → a xn= lim x → a a0 + a1a + a2a2 + . . . + anan= lim x → a = f(a)The limit of any rational function of the type m(x)/n(x), where n(x) ≠ 0 and m(x) and n(x) are polynomial functions, is:lim x → a [m(x)/n(x)]= lim x → a m(x)/lim x → a n(x)= m(a)/m(b) The very first step to find the limit of a rational function is to check if it is reduced to the form 0/0 at some point. If it is so, then we need to do some adjustments so that one can calculate the value of the limit. This can be done by canceling the factor which causes the limit to be of the form 0/0. For example,f(x) = (x2 – 4x + 4)/(x2 − 4)Taking limit over it for x = 2, the function is of the form 0/0,lim x → 2 f(x)= lim x → 2 (x2 – 4x + 4)/(x2 − 4)= lim x → 2 [(x – 2)2/(x + 2)(x – 2)]= lim x → 2 [(x – 2)/(x + 2)]= 0/4 (≠ 0/0) = 0If we are given a complex function then the limit of the complex function is calculated as, suppose we are given a function f(z) where z is a complex variable then the z = z0 then the f(z) is differentiable if,limΔz→0 [f(z0 + Δz) – f(z0)]/ΔzWhere, Δz = Δx + iΔyThe limit of exponential function is easily calculated by taking into consideration the initial value of the exponential function. Suppose we are given an exponential function f(x) = ax where a > 0.For f(b) > 1limx→∞ ax = ∞limx→-∞ ax = 0For 0 < f(b) < 1limx→∞ ax = 0limx→-∞ ax = ∞For the given function with two variables say f(x, y) then suppose if the limit of the function is C, (x, y) → (a, b) provided that ϵ > 0 here exists Δ > 0 such that |f(x, y) – C| < ϵ whenever 0 < √{(x -a)2 + (y – b)2} < Δ. Then,lim (x, y) → (a, b) f(x, y) = CExample 1: \(\begin{array}{l}\text{To Compute } \mathbf{\lim \limits_{x \to 1}} \frac{x^2 - 4x + 3}{(x-1)^2 }\end{array}\)To Compute lim x→4 (5x2 + 8x - 3) = 5(-4)2 + 8(-4) - 3 = 80 – 32 – 3 = 45 lim x→6 [(x-3)(x-2)/(x-4)] = [(6-3)(6-2)] / (6-4) = 12/2 = 6 lim x→3 ((x2 - 9)/(x - 3)) = lim x→3 (x+3) lim x→6 (x^2 - 4) / (x - 2) = ((6^2)-4)/(6-2)=20/4=5 You can refer to the example problems and solutions in the textbook to better understand the concepts. Try solving them using your own methods, and also check out the Inter Maths 1A and 1B solutions for additional help. The website provides textbook solutions for different exercises, including Limits and Continuity Exercise 8(a) to (e). You can also find model papers for SSC class 10 and Inter maths, as well as Intermediate Maths first year 1b Limits and Continuity solutions. Take a look at the Class 11 math solution for Inter 1st year maths 1B, which includes questions and solutions on Calculus limits and continuity. Note that you can observe the solutions and try them in your own methods, just like with junior inter maths 1b solutions.