

# 9 Lecture - MTH101

## Important Subjective

1. **What is a limit in calculus?**

A limit is a value that a function approaches as the input variable gets closer to a certain value.

2. **What is the importance of limits in calculus?**

Limits are important because they can be used to calculate the behavior of a function as it approaches certain points.

3. **What is the limit of a function  $f(x)$  as  $x$  approaches  $a$ ?**

The limit of a function  $f(x)$  as  $x$  approaches  $a$  is the value that  $f(x)$  approaches as  $x$  gets arbitrarily close to  $a$ .

4. **What is the formal definition of limits?**

The formal definition of limits involves the concept of epsilon-delta. It states that the limit of a function exists if and only if for any  $\epsilon > 0$ , there exists a  $\delta > 0$  such that  $|f(x) - L| < \epsilon$  whenever  $0 < |x - a| < \delta$ .

5. **What is the concept of one-sided limits?**

One-sided limits are used when the limit from the left or the right of a value is different.

6. **What is the difference between a limit and a function value?**

A function value is the value of the function at a specific point, while a limit is a value that the function approaches as the input variable gets arbitrarily close to a certain value.

7. **What is the limit of a constant function?**

The limit of a constant function is the same as the value of the constant.

8. **What is the limit of a rational function as  $x$  approaches infinity?**

The limit of a rational function as  $x$  approaches infinity depends on the degree of the numerator and denominator. If the degree of the numerator is less than the degree of the denominator, the limit is zero. If the degrees are equal, the limit is the ratio of the leading coefficients. If the degree of the numerator is greater than the degree of the denominator, the limit is either infinity

or negative infinity depending on the signs of the leading coefficients.

9. **What is the limit of a function that has a vertical asymptote?**

The limit of a function that has a vertical asymptote does not exist at the point of the vertical asymptote.

10. **How can limits be used to calculate derivatives?**

Limits are used to calculate derivatives by taking the limit of the difference quotient as the change in  $x$  approaches zero.