7. Limits

Limits of Exponential and Logarithmic Functions

The following results are useful in the evaluation of the limits of exponential and logarithmic functions:

1. limx→0ax-1x=logea, a>0

2. limx→0ex-1x=1

3. limx→0log1+xx=1

4.limx→01+x1x=e**Limits at Infinity**

A function *f* is said to tend to a limit *L* as x→∞if for δ>0, however small it may be, there exists a positive number *k* such that fx-L<δ ∀ *x* in the domain of *f*, for which *x* > *k*. This can be mathematically written as limx→∞fx=L.

1. limx→∞C=limx→-∞C=C, where *C* is a constant.

2. limx→∞Cxn=0, n>0

3.limx→-∞Cxn=0, n∈N

Infinite Limit

If for every *k* > 0, there exists δ>0 such that for all *x* in the domain of *f* and x∈a-δ, a+δ, we have *f*(*x*) > *k*, then the limit of *f*(*x*) as *x* tends to *a* is infinity. This can be mathematically written as limx→afx→∞.

The following steps can help evaluate algebraic limits at infinity:

1. If the function is not in rational form, i.e., fxgx, then first express it in rational form.

2. Divide the numerator and denominator by x^n , where *n* is the highest power of *x*.

3. Use the result limx→∞Cxn=0, n>0, and limx→∞C=C.