Engineering Mathematics (13M-15M)

- Calculus — (2-3M)
- Vector Calculus — (1-2M)
- Linear Algebra — (2-3M)
- Probability — (3-4M)
- Numerical methods — (0-1M)
- Complex function — (1-2M)
- differential Equation — (1-2M)
- Laplace Transform — (0-1M)

Books

↳ B.S. Garewal.

Concept of Zero and Infinity :-

→ Least non-negative no. is 0.

Eg :- $\frac{10}{4} = 2.5$ | $\frac{10}{100} = 0.1$

$\frac{10}{10} = 1$ | $\frac{10}{\infty} = 0$

- Infinity (∞) :- (determinate) ?
- Greatest +ve number is '∞'. (Least negative number is infinite.) ?

Def. :- Infinity is a behaviour of a variable which continously increases and passes all the limits which is undefined.

- Infinity is not a number.

Eg :- $\infty + \infty = \infty$, $\infty^{\infty} = \infty$, $a^{\infty} = \infty$ $(a > 1)$, $\frac{a}{\infty} = 0$ $(0 < a < 1)$, $\frac{a}{0} = \infty$ (undefined).

$0^{\infty} = 0$. (These operations are undefined not indeterminate.)

$\left.\begin{array}{l}\sin\infty \\ \text{or} \\ \cos\infty\end{array}\right\} \rightarrow$ any finite no. in between -1 to $+1$.

$e^{\infty} = \infty$ $\quad \log\infty = \infty$

$e^{-\infty} = 0$ $\quad \log 0 = -\infty$

Indeterminate Forms :-

(1) $\frac{0}{0} =$

$\frac{4}{2} = 2 \Rightarrow 4 = 2\times 2$

$\boxed{\frac{0}{0} = x \Rightarrow 0 = 0.x}$

$x = 0, 1, 2, 3 \ldots$

(2) $\frac{\infty}{\infty} =$

$\frac{\infty}{\infty} = x \Rightarrow \infty = \infty . x$

$x = 1, 2, 3 \ldots$

(III) $\infty - \infty$

$x = 1+1+1+1+ \dots \infty$

$y = 2+2+2+2+ \dots \infty$

$y - x \neq 0$

(IV) $0 \times \infty = \frac{1}{\infty} \times \infty = \frac{\infty}{\infty}$

(V) 0^0

$0^{\text{anything}} = 0$ $\qquad (\text{anything})^0 = 1$

(VI) ∞^0

$z = x^y$

$\log z = y \log x$

$= 0 \times \infty = \frac{\infty}{\infty}$

(VII) 1^∞

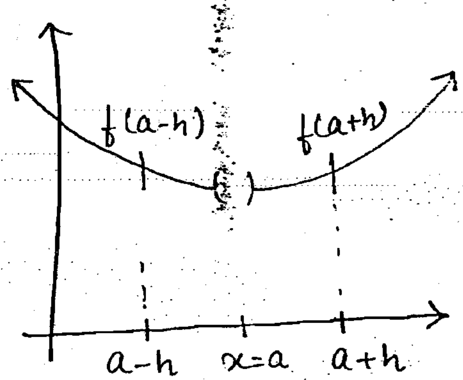
$z = x^y$ $\qquad \lim_{x \to \infty} \left(x + \frac{1}{x}\right)^x$

$\ln z = y \ln x$

$= \infty \ln 1$

$= \infty \times 0$

$= \frac{\infty}{\infty}$



if $\boxed{\lim_{h \to 0} f(a-h) = \lim_{h \to 0} f(a+h) = l}$

LHL = RHL

$\therefore$ The limit is said ~~to~~ be existance at $x = \infty$.

$l = \lim_{x \to a} f(h)$

$a - h \to$ LHS

$a + h \to$ RHS