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EXCELLENCE PROGRAM-SYJC (COMMERCE), 2019-20

SYNOPSIS

MATHEMATICS AND STATISTICS - PART 1

CONTUNUTY [08 MARKS FOR H.S.C.]

❖ **LIMITS :-**

1. $\lim_{x \to a} P(x) = P(a)$

2. $\lim_{x \to a} \sin x = \sin a$

3. $\lim_{x \to a} \cos x = \cos a$

4. $\lim_{x \to 0} \frac{\sin x}{x} = 1 = \lim_{x \to 0} \frac{x}{\sin x}$

5. $\lim_{x \to 0} \frac{\tan x}{x} = 1 = \lim_{x \to 0} \frac{x}{\tan x}$

6. $\lim_{x \to 0} \cos x = 1$

7. $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$

8. $\lim_{x \to 0} \frac{a^x - 1}{x} = \log a$

9. $\lim_{x \to 0} \frac{\log(1+x)}{x} = 1$

10. $\lim_{x \to 0} (1 + x)^{\frac{1}{x}} = e$

1) CONTUNUTY OF A FUNCTION AT A POINT:

A function is said to be continuous at a point $x = a$ if

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

b) $\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x) = f(a)$

Note: The following functions are always continuous on their domain

i) Constant function $ie\ f(x) = k\ , k\epsilon R\ is\ constsnt.$

ii) Polynomial function $ie\ f(x) = a_0 + +a_1x + a_2x^2 + \cdots + a_nx^n.$

iii) Rational function $ie\ \frac{f}{g}\ , f\ \&\ g\ are\ polynomial\ functions.$

iv) Trigonometric function $ie\ \sin(ax+b), \cos(ax+b),\ a\&b\ \epsilon R$

v) Exponential function $ie\ f(x) = a^x or\ f(x) = e^x\ , a > 0, a \neq 1$

vi) Logarithmic function $ie\ f(x) = \log_a x\ , a > 0, a \neq 1$

2) ALGEBRA OF CONTINUOUS FUNCTIONS

If f and g are two real valued functions defined on the same domain and continuous at x=a, then

i) The Function kf is continuous at $x = a, , k\epsilon R\ is\ constsnt$

ii) The Function $f \pm g$ is continuous at $x = a$

iii) The Function $f.g$ is continuous at $x = a$

iv) The Function $\frac{f}{g}$ is continuous at $x = a\ , g(a) \neq 0.$

v) Composite functions $f[g(x)]$ and $g[f(x)]$ are continuous at $x = a$

3) TYPES OF DISCONTINUITY:

- <u>REMOVABLE DISCONTINUITY:</u>

A real valued functions f is said to have **removable discontinuity at $x = a$** if

i) $\lim_{x \to a} f(x) \neq f(a)$ or

ii) $[\lim_{x \to a^-} f(x) = \lim_{x \to a^+} f(x) = \lim_{x \to a} f(x)] \neq f(a)$

This type of discontinuity can be removed by redefining the function f $at\ x = a$ as $\lim_{x \to a} f(x) = f(a)$ to make continuous function.

- <u>IRREMOVABLE DISCONTINUITY:</u>

A real valued functions f is said to have **irremovable discontinuity at $x = a$**

i) $\lim_{x \to a} f(x)$ does not exist or

ii) $\lim_{x \to a^-} f(x) \neq \lim_{x \to a^+} f(x)$ or

iii) $\lim_{x \to a^-} f(x)$does not exist or $\lim_{x \to a^+} f(x)$ does not exist

Such a function cannot be redefined.