Notes

Taylor Series ⇒

Taylor series is the polynomial or a function of an infinite sum of items. Each successive term will have a larger exponent or higher degree than the precending term.

$$f(x) = f(a) + \frac{f'(a)}{1!}(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \cdots$$

$f'(a)$, $f''(a)$, $f'''(a)$ are derivatives at point a of $f(x)$. If the value of a is 0 (zero), then the Taylor series is also called **Maclaurin** Series.

In the sigma notation -

$$f(x) = \sum_{n=0}^{\infty} \frac{f^n(a)}{n!}(x-a)^n$$

where $f^n(a)$ = n^{th} derivative of f

$n!$ = factorial of n

Taylor Series for sin(x) ⇒

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

Taylor Series in Several Variables ⇒

$$T(x_1, x_2, x_3, \ldots, x_m) = f(a_1, a_2, \ldots, a_m) + \sum_{j=1}^{m} \frac{\partial f(a_1, a_2, \ldots, a_m)}{\partial x_j}(x_j - a_j)$$

$$+ \frac{1}{2! \sum_{j=1}^{m}}$$

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Euler's Constant ⇒ (e)

$$\boxed{e = \lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n}$$

$$\boxed{e \simeq 2.7}$$

$\left(1 + \frac{1}{n}\right)^n$ k^{th} term

for $n > k$

$$\frac{n(n-1)\cdots(n-\overline{k-1})}{k!}\left(\frac{1}{n}\right)^k$$

$$= {}^{n}C_{k}\left(\frac{1}{n}\right)^k$$

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