

Question 19209

Linearization of function at given point is the best linear approximation of this function. In geometric sense, this is approximation of function by a slope at given point. In terms of Taylor series, this is the expansion at given point, to terms of power of 1.

The general formula for Taylor expansion at point a is: $f(x) = f(a) + \sum_{k=1}^{\infty} f^{(k)}|_{x=a} \cdot (x-a)$.
 $f^{(k)}$ denotes the k-th derivative, and $|_{x=a}$ denotes that this derivative is taken at point a.

Hence,

$$f(x) = x^4 - x^2 + 2 :$$

$$f(x) = f(1) + (4x^3 - 2x)|_{x=1} \cdot (x-1) = 2 + 2(x-1) + O(x^2)$$

$$f(x) = \ln x :$$

$$f(x) = \ln 1 + \frac{1}{x}|_{x=1} (x-1) = x-1 + O(x^2)$$

$O(x^2)$ means some terms of higher value, which are thrown away in linear approximation.