DERIVED FORMULAS FOR THE NTH DERIVATIVE OF SELECT FUNCTIONS

JOJIEMAR M. OBLIGAR, Pd.D.[1], EMIL C. ALCANTARA, Pd.D.[2]
https://orcid.org/0000-0003-1273-0222[1]
jojiemar01.obligar@deped.gov.ph[1], alcantara_emil0204@yahoo.com[2]
Batangas State University
Batangas City, Batangas, Philippines

ABSTRACT

Calculus is an important subject since it exists in most of university courses. Derivatives is one of the important concepts of calculus which is a precondition topic for most of mathematics courses and other courses in different fields of studies. The main aim of this study was to derive formulas for determining the nth derivative of some standard functions in selected forms. Also, it aimed to evaluate the Taylor Series Expansion and Maclaurin Series of select functions using the derived formulas for the nth derivative. In this study, basic research was employed. Expository method was used in developing the algorithms. Proofs through mathematical induction were presented to guarantee the generalization of the assertion. The following formulas for the nth derivative of selected functions were derived: $(ax^m)^{(n)} = \left[\prod_{j=0}^{n-1}(m-j)\right]ax^{m-n},\ m>0$; $(ax^m)^{(n)} = a\frac{(-1)^n\prod_{j=0}^{n-1}(m+j)}{x^{m+n}},\ m<0$; $[(ax+b)^m]^{(n)} = (a)^n\left[\prod_{j=0}^{n-1}(m-j)\right](ax+b)^{m-n}, n = 1,2,3,\ldots;\ m>0$; and $[(ax+b)^m]^{(n)} = \frac{(a)^n(-1)^n\prod_{j=0}^{n-1}(m+j)}{(ax+b)^{m+n}}, n = 1,2,3,\ldots;\ m<0$. The derived nth derivative formulas were applied to Taylor Series Expansion and Maclaurin Series.

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