

CURVE APPROXIMATION BY MEANS OF FUNCTIONS ANALOGOUS TO THE HERMITE POLYNOMIALS.

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I. Introduction

In an article by J. P. Gram entitled "Ueber die Entwicklung reeler Functionem in Reihen mittelst der Methode der kleinsten Quadrate"¹ a unique procedure is set forth which leads to a very great simplification in the usual method of curve fitting by the method of least squares. That this method has not been given more consideration is probably due to lack of knowledge of its existence, rather than to lack of appreciation of its merit. Edward Condon,² Raymond T. Birge and John D. Shea³ developed formulas by means of which curves can be fitted to certain types of data. Later, Harold T. Davis and Voris V. Latshaw⁴ developed specific formulas, with tables of coefficients, by means of which curves of the second to the seventh degree can be fitted to the data with a minimum amount of computation. In a later paper, Professor Davis⁵ has employed Gram's method and in this way has developed a set of functions analogous to the Legendre polynomials.

The purposes of the present paper are:

(1) To develop formulas for fitting curves of the second to the sixth degree to given data by the method of least squares where the $n+1$ frequencies of the data have the terms of the expansion of $(\frac{1}{2} + \frac{1}{2})^n$ as weighting factors.

¹Journal für Mathematik, Vol. 94, 1894, pp. 41-73, especially pp. 42-46.

²"The Rapid Fitting of a Certain Class of Empirical Formulae by the Method of Least Squares." Univ. of California Pub. in Math. Vol. 2, No. 4, pp. 55-66, March 1927.

³"A Rapid Method for Calculating the Least Squares Solution of a Polynomial of any Degree." University of California Publications in Mathematics. Vol. 2, No. 5, pp. 67-118, March 1927.

⁴"Formulas for the Fitting of Polynomials to Data by the method of Least Squares." Annals of Mathematics, Second Series, Vol. 31, No. 1, Jan. 1930, pp. 52-78.