NEW FUNCTIONAL RELATION FOR THE DILOGARITHM INVOLVING TWO VARIABLES

Jorge Luis Cimadevilla Villacrota and M. P. Chaudhary*

C/Alava, 15 1 D, 33210, Gijon, Asturias, SPAIN

E-mail : villacorta1968@hotmail.com

*International Scientific Research and Welfare Organization
(Albert Einstein Chair Professor of Mathematical Sciences)
New Delhi 110018, INDIA

E-mail : dr.m.p.chaudhary@gmail.com

Abstract: We establish new functional relations for the dilogarithm involving two variables, which adhere the properties of Polylogarithm. We also considered several closely-related identities such as (for example) polylogarithm (also known as Jonquière's function), Euler dilogarithm function and Clausen's function.

Keywords and Phrases: Polylogarithm; Dilogarithm identity or Spence's function; Clausen's function; Definite Integral.

2020 Mathematics Subject Classification: 11A05, 11Y16, 68Q25.

1. Introduction and Definitions

Alfre Jonquière introduced the concept of polylogarithm (also known as Jonquière's function) (see, for details [6]; [8]; [10]; and [20]), which is a special function represented as $Li_s(z)$ of order s and argument z. The polylogarithm reduces to an elementary function such as natural logarithm or rational functions for special values of s. The polylogarithm function appears as closed form of integrals such as *Fermi-Dirac integral* and *Bose-Einstein integral* (see [12] and [15]) etc. The polylogarithm of positive integer order arise in the calculation of processes represented by the *Feynman diagrams*; and it is also equivalent to Hurwitz Zeta function (see