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This paper introduces two formal equivalent definitions of the Cobb-Douglas function for a continuum model based on a generalization of the Constant Elasticity of Substitution (CES) function for a continuum under not necessarily constant returns to scale and based on principles of product calculus. New properties are developed, and to illustrate the potential of using the product integral and its functional derivative, it is shown how the profit maximization problem of a single competitive firm using a continuum of factors of production can be solved in a manner that is completely analogous to the one used in the discrete case.

Keywords: CES function, Cobb-Douglas function, continuum, product integral, functional derivative.

JEL: D11, D21.