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Mel S. Berger*, MIT Department of Mathematics, 2-236, 77 Massachusetts Avenue, Cambridge, MA 02139. *The fundamental theorem of multivariable calculus and its applications.*

An astonishing omission has occurred in multivariable calculus. The fundamental theorem of the subject has been ill-determined. This theorem should state exactly when a smooth vector-valued function can be reconstructed from its derivatives by integration processes. In 3D these differential processes are div and curl. In higher dimensions only two differential processes involving the external derivative and its adjoint are needed. This is Hodge theory and was only clarified in the 1930s. The result states that a vector field can be decomposed into two orthogonal pieces: the irrotational piece and the solenoidal piece. In mathematical economics the solenoidal piece is always set equal to zero, resulting in the misguided and unethical corporate financial theory that has been the unfortunate hallmark of this part of the 21st century. (Received September 22, 2000)