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M. Zuhair Nashed* (m.nashed@ucf.edu), Professor Zuhair Nashed, Department of Mathematics, University of Central Florida, Orlando, FL 32816. *Variational gradients in function spaces.*

In a series of papers (see [1] and [2] and refernces therein), Hamilton and Nashed introduced and studied new notions of (locally defined) regular and singular variational derivatives, and singular bivariational derivatives. General representation theorems for the Gateaux variation of a functional are established in terms of these notions. . These notions and results resolve difficulties inherent in what Volterra called "exceptional points" and in the classical treatment of functional (or Volterra) derivative. In this talk, we introduce notions of regular gradients and singular gradients in function spaces that resolve these difficulties, and apply them to examples in the calculus of variations and variational problems. (Received September 23, 2015)