

This work represents an overview of the given topic. After a short historical introduction, we present all necessary results from the classical theory of differentiation and integration. The core of the thesis is concerned with the Riemann-Liouville (R-L) integral and derivative of real functions defined on compact intervals. We prove basic properties for integrable as well as continuous functions. Along with the R-L definition, we also give the Caputo and Grünwald-Letnikov definitions and their mutual relations. Furthermore, we calculate the R-L derivatives of some elementary functions as well as basis functions from the finite element method. The last part is concerned with the numerical approximation of R-L derivatives. We describe and implement two algorithms, which we test on several functions.