All real structures are inherently nonlinear. Whether a structure exhibits linear or nonlinear behavior, depends mainly on the excitation level. So far no unequivocal framework for experimental detection, localization, and characterization of structural nonlinearities from dynamic measurements exists. The present study suggests a framework for the detection of structural nonlinearities. Two methods for detection are compared, the homogeneity method and a Hilbert transform based method. Based on these two methods, a nonlinearity index is suggested. Through simulations and laboratory experiments it is demonstrated, for a simple but representative nonlinear structure, that both detection methods are able to detect even weak nonlinearities, and that the nonlinearity index provides a sensitive and robust measure of nonlinearity. For a range of input force amplitudes, it is shown that it is possible to estimate a system's linear and nonlinear regimes in terms of input amplitude, and assess the strength of the nonlinearity.