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A New Approach to Soliton Stability for the KdV Equation

In this work, we consider the KdV equation in the exponentially weighted spaces of Pego and Weinstein. We prove local well-posedness of the perturbation (weighted and unweighted) in the Bourgain $X^{1,b}$ space, allowing us to recreate the Pego-Weinstein result via iteration. By combining this result with the I -method, we expect ultimately to obtain soliton stability for KdV with initial data too rough to be in H^1 .