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"The numerical solution of nonlinear time-dependent partial differential equations"

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In practice, we often solve partial differential equations numerically without any knowledge whether the underlying analytic problem has a solution. The question therefore is: Can we use the numerical results to decide or, at least, make plausible that the analytic problem has in fact a solution which is close to the numerical solution.

We will see that, in many cases, we can interpolate the numerical solution and show that the interpolant solves the problem for slightly perturbed data. This is as close as numerical methods can get us. To decide whether the original problem has a solution is a matter of local stability. We shall discuss different techniques to decide this question and apply them to recent turbulence calculations.