Equivalence of seminorms, error bounds, and quasi-optimal methods

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Norms and their generalizations are an important tool in the numerical analysis of partial differential equations and approximation theory. They are employed to define trial and test spaces in the weak formulation, to describe asymptotic error-cost balances and to measure smoothness. A useful relationship between norms is their equivalence. For example, the characterization of functions with a certain convergence rate often amounts to the equivalence of a norm for the error-cost balance and a smoothness norm.

The goal of this talk is to highlight the usefulness of seminorm equivalences. To this end, we will recall conditions for such an equivalence and then review recent results in a priori and a posteriori error analysis and the quasi-optimality of Galerkin methods.