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Paper in a journal - M21a: Superconvergence analysis of FEM and SDFEM on graded meshes for a problem with characteristic layers (https://doi.org/10.1016/j.camwa.2021.04.009)

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We consider a singularly perturbed convection-diffusion boundary value problem whose solution contains exponential and characteristic boundary layers. The problem is numerically solved by the FEM and SDFEM method with bilinear elements on a graded mesh. For the FEM we prove almost uniform convergence and superconvergence. The use of a graded mesh allows for the SDFEM to yield almost uniform estimates in the SD norm, which is not possible for Shishkin type meshes. Numerical results are presented to support theoretical bounds.