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High order finite volume methods for singular perturbation problems

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*Keywords:* singularly perturbed fourth order ordinary differential equation; finite volume finite element method; Hermite cubic element; error bound; generating function; optimal mesh

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*Review text:*

The authors consider a singularly perturbed fourth order ordinary differential equation. Following an expansion for the exact solution, they consider an optimal mesh. A Hermite cubic element finite volume solution is introduced. The authors prove that this approximate solution is of order  $N^{-2}$ , where  $N$  is the number of the primal mesh points, in some convenient norm. In particular, this estimate yields the convergence order  $N^{-2}$  uniform in the perturbation parameter in an energy norm. Numerical examples to justify the theoretical results are presented.

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