

[Stynes, Martin](#)

Steady-state convection-diffusion problems. (English) [Zbl 1115.65108](#)
[Acta Numerica 14, 445-508 \(2005\)](#).

In this survey the author notices that the solutions of convection-diffusion problems have a convective nature on most of the domain of the problem and the diffusive part of the differential operator is influential only in certain narrow subdomains. The fact that the elliptic nature of the differential operator is disguised on most of the domain means that numerical methods designed for elliptic problems may not work satisfactorily.

The paper begins by examining the asymptotic nature of solutions to stationary convection-diffusion problems, providing a suitable framework for the understanding of these solutions and the difficulties that numerical techniques will face. Various numerical methods (finite difference methods in one and two dimensions, finite element methods) are presented and extensively discussed (including a priori estimates and the use of special meshes).

Reviewer: [Adrian Carabineanu \(București\)](#)

MSC:

- [65N06](#) Finite difference methods for boundary value problems involving PDEs
- [65N30](#) Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
- [35J25](#) Boundary value problems for second-order elliptic equations
- [65N15](#) Error bounds for boundary value problems involving PDEs
- [65-02](#) Research exposition (monographs, survey articles) pertaining to numerical analysis

Cited in **1** Review
Cited in **94** Documents

Keywords:

[finite difference](#); [finite element](#); [error estimates](#); [survey paper](#); [convection-diffusion problems](#)

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