

# A brief Report on the article “Legendre–Galerkin Method for Sixth–Order Boundary Value Problems”

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**Abstract:** The author presents spectral algorithms based on the Legendre Galerkin method for direct solution of sixth order elliptic differential equations subject to homogeneous and non homogeneous boundary conditions. This leads to discrete systems with specially structured matrices that can be efficiently inverted. Direct solution algorithms based on tensor matrix algebra for homogeneous problems in two dimensions are also discussed.

**Key words and phrases:** sixth–order boundary value problems; Legendre–Galerkin Method; specially structured matrices; two dimensions

**Subject Classification:** 65M? (to be checked!)

## 1 Motivation: in which area appear the problem

- Modeling of many practical problems in Mechanics and other areas of Mathematical Physics require solutions of elliptic equations.
- Sixth order elliptic differential equations are known to arise *Astrophysics*: the narrow connecting , The authors layers bounded by stable layers, which are believed to surround A–type stars, maybe modelled by sixth order boundary value problems.

## 2 Some literature

- There is no so much results concerning numerical methods for Sixth order elliptic differential equations.
- There is some results concerning existence and uniqueness of the solutions of Sixth order elliptic differential equations.

## References

- [BHR 09] A. H. BHRAWY: Legendre–Galerkin Method for Sixth–Order Boundary Value Problems. *J. Egypt Math. Soc.*, **17**(2), 173–188, 2009.
- [EVA 98] L. C. EVAN: Partial Differential Equations. Graduate Studies in Mathematics. *American Mathematical Society*, **19**, 1998.