



# Numerical solution of the two-dimensional first kind Fredholm integral equations using a regularized collocation method

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## Abstract

In this study, we present an advanced numerical model for solving the 2D first kind Fredholm integral equations, which are well known to be ill-posed problems. This numerical approach is built on the quadrature formula with the Lavrentiev regularization method. Under some essential assumptions, a comprehensive theoretical explanation of the presented numerical approach is provided. Finally, various numerical examples support the theoretical findings and demonstrate the accuracy of our method.

**Keywords** Ill-posed problems · Tikhonov regularization · Lavrentiev regularization · Gauss–Legendre quadrature · Two-dimensional integral equations of the first kind

**Mathematics Subject Classification** 47A52 · 65R30

## 1 Introduction

Various problems in physical sciences, engineering, mechanics, electrostatics, and several other applied sciences can be transformed into 2D first kind Fredholm integral equations (see Kirsch 2011; Kanwal 2013; Lu et al. 2010; Pachpatte 2011).

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