

## **On numerical solution of a certain hypersingular integral equation of the first kind**

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### **Summary**

In this paper, we first discuss the midpoint rule for evaluating hypersingular integrals with the kernel  $\sin^{-2}(x-s)/2$  defined on a circle, and the key point is placed on its *pointwise superconvergence phenomenon*. We show that this phenomenon occurs when the singular point  $s$  is located at the midpoint of each subinterval and obtain the corresponding superconvergence analysis. Then we apply the rule to construct a collocation scheme for solving the relevant hypersingular integral equation, by choosing the midpoints as the collocation points. It's interesting that the inverse of coefficient matrix for the resulting linear system has an explicit expression, by which an optimal error estimate is established. At last, some numerical experiments are presented to confirm the theoretical analysis.

