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A high-order piecewise quartic spline rule for Hadamard integral and its application of the cavity scattering. (English) [Zbl 07448863](#)

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Summary: We develop a fourth-order piecewise quartic spline rule for Hadamard integral. The quadrature formula of Hadamard integral is obtained by replacing the integrand function with the piecewise quartic spline interpolation function. We establish corresponding error estimates and analyze the numerical stability. The rule can achieve fourth-order convergence at any point in the interval, even when the singular point coincides with the grid point. Since the derivative information of the integrand is not required, the rule can be easily applied to solve many practical problems. Finally, the quadrature formula is applied to solve the electromagnetic scattering from cavities with different wave numbers, which improves the whole accuracy of the solution. Numerical experiments are presented to show the efficiency and accuracy of the theoretical analysis.

MSC:

[65D07](#) Numerical computation using splines

[78M12](#) Finite volume methods, finite integration techniques applied to problems in optics and electromagnetic theory

[78A45](#) Diffraction, scattering

Keywords:

Hadamard integral; piecewise quartic spline rule; error estimate; electromagnetic scattering

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