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COMPUTATION OF THE MATRIX PTH ROOT AND ITS FRÉCHET DERIVATIVE BY INTEGRALS*

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Abstract. We present new integral representations for the matrix pth root and its Fréchet derivative and then investigate the computation of these functions by numerical quadrature. Three different quadrature rules are considered: composite trapezoidal, Gauss-Legendre and adaptive Simpson. The problem of computing the matrix pth root times a vector without the explicit evaluation of the pth root is also analyzed and bounds for the norm of the matrix pth root and its Fréchet derivative are derived.

Key words. matrix pth root, Fréchet derivative, quadrature, composite trapezoidal rule, Gauss-Legendre rule, adaptive Simpson rule

AMS subject classifications. 65F60, 65D30

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