1077-65-105 **Oksana Bihun** (obihun@cord.edu), **Austin Bren*** (asbren@cord.edu), **Michael Dyrud** (mdyrud@cord.edu) and **Kristin Heysse** (keheysse@cord.edu). *Trigonometric Interpolation for Numerical Solution of Differential Equations.*

We use trigonometric interpolation to approximate solutions of a differential equation $Qu = f$, whose differential operator Q with domain $D(Q)$ is a formal polynomial of operators $\{1, x, d/dx\}$. A solution u is projected onto the space T_n of trigonometric polynomials of degree n. The projection Tu, defined as a trigonometric interpolant of u, is identified with a vector $\hat{u}$ of its values at partition points via an isomorphism π. The operator Q is represented by a square matrix $\hat{Q}$ defined implicitly by $\hat{Q}\hat{v} = \pi TQTv$ for all $v \in D(Q)$. The original equation is approximated by a system of linear equations $\hat{Q}\hat{u} = \hat{f}$, where $\hat{f} = \pi Tf$.

We prove that if $Q = a_0 + a_1 \frac{d}{dx} + \ldots + a_s \frac{d^s}{dx^s}$, then $\operatorname{rank} \hat{Q} = \dim \hat{Q} + |\text{sign } a_0| - 2m - 1$, where $m \geq 0$ is the number of solutions, in the set $\{1, 2, \ldots, n\}$, of a certain system of polynomial equations . Our numerical tests show high accuracy and fast convergence of the method applied to several boundary and eigenvalue problems for differential equations.

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