1077-65-996 **Oksana Bihun*** (`obihun@cord.edu`). *A Projective Method for Numerical Solution of Differential Equations.*

We solve boundary and eigenvalue problems for ordinary and partial linear differential equations by projecting their solution spaces onto an n-dimensional space of algebraic or trigonometric polynomials H_n, which we identify with $\mathbb{R}^n$ via an isomorphism $\psi : H_n \to \mathbb{R}^n$. Let A be a differential operator from the enveloping algebra of $\oplus_{i=1}^{d}\{1, x_i, \frac{\partial}{\partial x_i}\}$ whose domain is a subset of a suitable Hilbert space H. The projection $P_n : H \to H_n$ is defined via Lagrangian interpolation or using partial sums of a Fourier series. The differential equation $Au = f$ is reduced to a system of linear equations $A_n u_n = f_n$, where $A_n \in \mathbb{R}^{n\times n}$ is a representation of A, $f_n = \psi P_n f$, and $u_n \in \mathbb{R}^n$ approximates the projection $\psi P_n u$ of a solution u. The dimension of the solution space of the reduced problem depends on the rank of the representation A_n. We prove several formulas that allow to compute the rank of matrix representations of certain linear differential operators. We prove approximation estimates and perform numerous numerical tests, which show a fast convergence rate and high accuracy of the method. (Received September 15, 2011)