A new integral transform involving Dawson's integral and its applications.

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Abstract: This presentation is devoted to a new integral transform with the kernel Dawson's integral, $\mathrm{daw}(x)$, sometimes called Dawson's function which is defined by the integral

$$\mathrm{daw}(x) = \int_0^x \exp(y^2 - x^2)\, dy. \tag{1}$$

This function appears in a variety of applications including spectroscopy, heat conduction, and electrical oscillations in certain special vacuum tubes [1]. We establish relationships among the other well known integral transforms including the $\mathcal{L}_2$-transform, Widder's potential transform and Dawson's integral transform.

Using the operational properties of the $\mathcal{L}_2$-transform (see [2]), we show how to solve Dawson's differential equation and introduce a new sequence of polynomials appears from the higher order derivatives of Dawson's integral. Furthermore, we investigate the properties of the Pascal type triangle appearing from the coefficients of the new sequence of polynomials.

Keywords: Riesz basis, regular boundary conditions, eigenvalues, root functions, spectral problem, integral perturbation of boundary condition, characteristic determinant

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References

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