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A New Integral Transform for Solving Physical Problems JOHN VASTOLA, COSTAS EFTHIMIOU, University of Central Florida — Finding a good integral representation of the reciprocal gamma function is a problem that arises naturally from a certain method of evaluating infinite sums. After finding one representation, and observing that its form is suggestive of an integral transform, we naively define one, and go on to explore its properties. While our transform as we initially define it turns out to be problematic, we demonstrate how to redefine it so that important properties (reminiscent of the Laplace and Fourier transforms) are preserved. Of particular interest is that we may transform any entire function, and that the values of the transform at the nonnegative integers correspond to the function's Taylor coefficients. We may also transform large classes of continuous and meromorphic functions. Interestingly, the aforementioned relationship between a function's transform and a function's Taylor series can be exploited to calculate analytic "approximations" to transformable functions. Other topics, like defining the transform for real and complex arguments, and the geometry of transformed functions, are considered. Applications to ordinary and partial differential equations, and related physical problems (from classical mechanics, electrodynamics, and quantum mechanics, among others) are discussed.

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