1075-65-224 **Frank Stenger*** (`stenger@cs.utah.edu`). *Approximating Indefinite Convolutions.*

The two integrals integrals defined on $(a,b) \subset \mathbb{R}$

$$p(x) = \int_a^x f(x-t)g(t)dt,\ q(x) = \int_x^b f(t-x)g(t)dt \tag{1}$$

arise in many areas of analysis and applications, such as control theory, Volterra integral equations, fractional integrals, integrodifferential equations, etc. Using the operator notations

$$(J^+g)(x) = \int_a^x g(t)\,dt,\ (J^-g)(x) = \int_x^b g(t)\,dt, \tag{2}$$

and the "Laplace transform" formula

$$F(s) = \int_0^c e^{-t/s} f(t)\,dt, \Re s > 0,\ c \geq (b-a), \tag{3}$$

(1) becomes

$$p = F(J^+)g,\ q = F(J^-)g, \tag{4}$$

This talk presents some new identities made possible via (4), such as Laplace transform inversion, $f = (J^+)^{-1}F(J^+)1$, the Hilbert transform, $Hg = (\log J^- \log J^+)g$, and for solving Wiener-Hopf equations, $f(x) + \int_0^\infty k(x-t)\,f(t)\,dt = g(x), \quad x \in (0,\infty)$. These identities and the formulas (4) can be accurately approximated using known methods for approximating the integrals (2). The talk also presents a new way of evaluating (4), and the use of the identities (4) together with the approximations of the integrals (2) to enable novel efficient methods that do not require the use of large matrices for solving partial differential equations. (Received August 30, 2011)