example from the theory of Fourier series that there exists a divergent series $\sum_{n=0} a_n$ such that $\sigma_n^{(2)} - s = 0(n^{-2\alpha'})$, $0 < \alpha' < \alpha < 1$ and $a_n = O(n^{\alpha-1})$. (Received January 5, 1944.)

77. D. V. Widder: *The iterates of the Laplace kernel.*

The iterates of the Laplace kernel $G_0(x, y) = e^{-xy}$ are defined by the recursion relation $G_n(x, y) = \int_0^\infty G_0(x, t)G_{n-1}(t, y)dt$, $n = 1, 2, \cdots$. In an earlier paper (Bull. Amer. Soc. vol. 43 p. 813) the author determined explicitly all these functions which have odd subscripts. They are rational functions of x, y and $\log(x/y)$. In the present paper the iterates with even subscripts are studied. They cannot be expressed in terms of the elementary functions. Complete asymptotic series for their behavior near $x = +\infty$ are obtained. For their behavior near the origin they are developed in power series which converge for all positive values of x. The method consists in expressing the nth iterate in terms of a function $h_n(x)$ whose bilateral Laplace transform turns out to be $\Gamma(-s)^{n+1}\,\Gamma(s+1)^n$. The function $h_n(x)$ is in turn expressible in terms of a new set of transcendental functions related to the familiar exponential integral $EI(x)$. (Received January 14, 1944.)

Applied Mathematics

78. Stefan Bergman: *On solutions of certain partial differential equations in three variables.*

(I) Let $\mathrm{E}(x, y, z, t, \tau)$ be a solution of the equation $\mathrm{G(E)} \equiv \mathrm{L(E)} + [\tau^{-1}U^{-1}(1-\tau^2)(\mathrm{E}_x + i\mathrm{E}_y \cos t + i\mathrm{E}_z \sin t)_\tau] + A[(1/2)\tau^{-1}(1-\tau^2)\mathrm{E}]_\tau$ which satisfies certain boundary conditions. Here $\mathrm{L(E)} \equiv \Delta\mathrm{E} + A(x\mathrm{E}_x + y\mathrm{E}_y + z\mathrm{E}_z) + C\mathrm{E}$, $U \equiv x + iy \cos t + iz \sin t$. Then $\psi(x, y, z) = \int_0^{2\pi}\int_{-1}^{1} \mathrm{E}f[(1/2)u(1-\tau^2), t]/dtd\tau$, where $f(\zeta, t)$ is an arbitrary analytic function of ζ and t, will be a solution of $\mathrm{L}(\psi) = 0$. (II) If A and C are entire functions of $r^2 = x^2 + y^2 + z^2$ alone, then $\mathrm{G(E)}$ becomes $\mathrm{G_0(E)} \equiv (1-\tau^2)\mathrm{E}_{\tau\tau} - \tau^{-1}(1+\tau^2)\mathrm{E}_\tau + r\tau[\mathrm{E}_{rr} + 2r^{-1}\mathrm{E}_r + B\mathrm{E}] = 0$ where $B = [-(3/2)A - (1/2)rA_r + C - (1/4)r^2A^2]$. The author shows that in the case II, there always exists a solution $\mathrm{E} = \mathrm{H}(r, \tau)$ of $\mathrm{G_0(E)} = 0$, which is an entire function of r. The author considers vectors $S = (\psi_1, \psi_2, \psi_3)$ where $\psi_1 = \int_0^{2\pi}\int_{-1}^{1} \mathrm{H}fdtd\tau$, $\psi_2 = i\int_0^{2\pi}\int_{-1}^{1} \mathrm{H}f \cos t dtd\tau$, $\psi_3 = i\int_0^{2\pi}\int_{-1}^{1} \mathrm{H}f \sin t dtd\tau$. Clearly $\mathrm{L}(\psi_K) = 0$, $K = 1, 2, 3$. Let c^1 be a simple closed curve which lies on a sphere $x^2 + y^2 + z^2 = \text{const.}$ If the ψ_K are regular in this sphere then $\int_{c^1} S \cdot dX = 0$. Here $X = (x, y, z)$, and $\cdot$ means the interior product. "Residue" theorems are derived if the ψ_K have singularities in the above sphere. Applications in the theory of waves propagation are indicated. (Received January 28, 1944.)

79. Nathaniel Coburn: *A boundary value problem in plane plasticity for the Coulomb yield condition.*

The following problem is studied: given a semi-plane $x > 0$, composed of plastic material which follows the Coulomb yield condition; the stresses σ_x, σ_y, σ_{xy} acting on the boundary $x = 0$ are considered as known; to find the stresses at any point in the interior of the semi-plane. The method of attack is a modification of that used in studying a similar problem for a perfectly plastic material. The stresses and the functions $\sin 2\gamma$, $\cos 2\gamma$ (where γ is the angle between the x-axis and a tangent to a line of principal shearing stress) are expanded in power series of the friction coefficient. Substituting these power series into the Levy equations, there results an infinite set of Levy equations for the various approximations to the stresses. By requiring that