KOEFFITSIENTI UZILISHGA EGA BO‘LGAN YUKLANGAN TENGLAMA UCHUN CHEGARAVIY MASALA

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Jahon miqyosida olib borilayotgan ko‘plab ilmiy-amaliy tadqiqotlar, aksariyat hollarda differensial tenglamalarning yuklangan holdagi matematik modellarini tadqiq qilish masalalariga keltiriladi. Matematik fizika, matematik biologiya, iqtisodiy matematika va optimal boshqaruvning muhim masalalari xususan, chekli tezlikdagi jismlardagi issiqlik va og‘irlik o‘tkazuvchanlik masalalari, dispersiyalovchi muhitda to‘lqin tarqalish masalalari, dinamik tarqalishlar nazariyasi masalalari, tuproq namligi, namlik darajasini boshqarish va uzoq muddatli baholashni prognoz qilish kabi masalalar xususiy hosilali yuklangan differensial tenglamalar uchun chegaraviy masalalarga keltiriladi. Hozirgi vaqtda yuklangan differensial va integrodifferensial tenglamalar uchun to‘g‘ri va teskari masalalarini tadqiq qilish xususiy hosilali differensial tenglamalar nazariyasining muhim vazifalaridan biri bo‘lib qolmoqda.

Yuklangan tenglamalar uchun qo‘yiladigan masalalarni hal etish uchun avvalo yuklanmagan tenglamalar uchun chegaraviy masallarni tadqiq etish maqsadga muvofiq bunday ishlar [1-8] tadqiqotlarda ko‘rilgan. Yuklangan va yuklangan Bessel tenglamasiga keltiriladigan tenglamalar uchun chegaraviy masalalar tadqiq etilgan ishlar [9-10] tadqiqoqtlarda ishlar olib borilgan. Ushbu tadqiqot ishi yuklangan Bessel tenglamasiga keltiriladigan tenglamalar ustida olib borilgan ishlarning mantiqiy davomi hisoblanadi.

$(-T,0)\cup(0,T)$ sohada quyidagi

$$y''(x)+\frac{2\gamma}{t}y'(x)+sign(x)\lambda^4 y(x)=y\left(sign(x)x_0\right) \qquad (1)$$

yuklangan tenglamani qaraylik, bu yerda $T,\gamma,\lambda\in R$ bo’lib, $T>0$, $\gamma\in(-1/2,1/2)$.

(1) tenglama uchun quyidagi chegaraviy masalani o‘rganamiz:

Masala. $(-T,0)\cup(0,T)$ sohada (1) tenglamaning shunday $y(x)$ yechimi topilsinki, u ushbu

$$y(T)=k_1, \qquad y(-T)=k_2 \qquad (2)$$

chegaraviy shartlarni hamda

$$\lim_{t\to-0}y(x)=\lim_{t\to+0}y(x), \qquad \lim_{t\to+0}x^{2\gamma}y'(x)=\lim_{t\to-0}(-x)^{2\gamma}y'(x) \qquad (3)$$

ulash shartlarni qanoatlantirsin, bu yerda k_1 –berilgan haqiqiy son.

Masalani tadqiq qilishga o‘tamiz.

(1) tenglama $(-T,0)$ ва $(0,T)$ intervallarda mos holda

$$y''(x)+\frac{2\gamma}{t}y'(x)+\lambda^4 y(x)=y(x_0), \qquad (4)$$

$$y''(x)+\frac{2\gamma}{t}y'(x)-\lambda^4 y(x)=y(-x_0) \qquad (5)$$

ko‘rinishlarni oladi.

Ma’lumki, (4) va (5) tenglamalarga mos bir jisli tenglamalarining umumiy yechimlari

$$y(x)=C_1 x^{\frac{1}{2}-\gamma}J_{\frac{1}{2}-\gamma}(\lambda^2 x)+C_2 x^{\frac{1}{2}-\gamma}J_{\gamma-\frac{1}{2}}(\lambda^2 x) \qquad (6)$$

$$y(x)=C_3(-x)^{\frac{1}{2}-\gamma}I_{\frac{1}{2}-\gamma}(-\lambda^2 x)+C_4(-x)^{\frac{1}{2}-\gamma}I_{\gamma-\frac{1}{2}}(-\lambda^2 x) \qquad (7)$$

(4) va (5) tenglamalarning umumiy yechimini topish uchun o‘zgarmasni variatsiyalash usulidan foydalanib

$$\begin{cases} C_1'(x)x^{\frac{1}{2}-\gamma}J_{\frac{1}{2}-\gamma}(\lambda^2 x)+C_2'(x)x^{\frac{1}{2}-\gamma}J_{\gamma-\frac{1}{2}}(\lambda^2 x)=0 \\ \lambda^2\cdot C_1'(x)x^{\frac{1}{2}-\gamma}J_{-\frac{1}{2}-\gamma}(\lambda^2 x)-\lambda^2\cdot C_2'(x)x^{\frac{1}{2}-\gamma}J_{\gamma+\frac{1}{2}}(\lambda^2 x)=y(x_0) \end{cases} \qquad (8)$$

$$\begin{cases} C_3'(x)(-x)^{\frac{1}{2}-\gamma}I_{\frac{1}{2}-\gamma}(-\lambda^2 x)+C_4'(x)(-x)^{\frac{1}{2}-\gamma}I_{\gamma-\frac{1}{2}}(-\lambda^2 x)=0 \\ \lambda^2\cdot C_3'(x)(-x)^{\frac{1}{2}-\gamma}I_{-\frac{1}{2}-\gamma}(-\lambda^2 x)+\lambda^2\cdot C_4'(x)(-x)^{\frac{1}{2}-\gamma}I_{\gamma+\frac{1}{2}}(-\lambda^2 x)=y(-x_0) \end{cases} \qquad (9)$$

Bundan $C_1'(x)$, $C_2'(x)$, $C_3'(x)$, $C_4'(x)$ o‘zgarmaslarni

$$C_1'(x)=\frac{\pi x y(x_0)J_{\gamma-\frac{1}{2}}(\lambda^2 x)}{2x^{\frac{1}{2}-\gamma}\cos\pi\gamma},\quad C_2'(x)=\frac{\pi x y(x_0)J_{\frac{1}{2}-\gamma}(\lambda^2 x)}{2x^{\frac{1}{2}-\gamma}\cos\pi\gamma} \qquad (10)$$

$$C_3'(-x)=\frac{\pi(-x)y(-x_0)I_{\gamma-\frac{1}{2}}(-\lambda^2 x)}{2(-x)^{\frac{1}{2}-\gamma}\cos\pi\gamma},\qquad C_4'(-x)=-\frac{\pi(-x)y(-x_0)I_{\frac{1}{2}-\gamma}(-\lambda^2 x)}{2(-x)^{\frac{1}{2}-\gamma}\cos\pi\gamma}$$

(11)

ko‘rinishda topamiz va (10) ni $[0,x]$da, (11) ni $[x,0]$ da integrallab $C_1(x)$, $C_2(x)$, $C_3(x)$, $C_4(x)$ larni

$$C_1(x)=\frac{\pi y(x_0)}{2\cos\pi\gamma}\int_0^x z^{\frac{1}{2}+\gamma}J_{\gamma-\frac{1}{2}}(\lambda^2 z)dz+C_1 \qquad (12)$$

$$C_2(x)=\frac{\pi y(x_0)}{2\cos\pi\gamma}\int_0^x z^{\frac{1}{2}+\gamma}J_{\frac{1}{2}-\gamma}(\lambda^2 z)dz+C_2 \qquad (13)$$

$$C_3(-x)=\frac{\pi y(-x_0)}{2\cos\pi\gamma}\int_x^0 (-z)^{\frac{1}{2}+\gamma}I_{\gamma-\frac{1}{2}}(-\lambda^2 z)dz+C_3 \qquad (14)$$

$$C_4(-x)=-\frac{\pi y(-x_0)}{2\cos\pi\gamma}\int_0^0 (-z)^{\frac{1}{2}+\gamma}I_{\frac{1}{2}-\gamma}(-\lambda^2 z)dz+C_4 \qquad (15)$$

ko‘rinishda topamiz.

(12) va (13)) tengliklarni (3) ga, (14) va (15) tengliklarni (7) ga qo‘yib (4) va (5) tenglamalarning umumiy yechimlarini

$$y(x)=C_1x^{\frac{1}{2}-\gamma}J_{\frac{1}{2}-\gamma}(\lambda^2x)+C_2x^{\frac{1}{2}-\gamma}J_{\gamma-\frac{1}{2}}(\lambda^2x)+$$

$$+\frac{\pi y(x_0)}{2\cos\pi\gamma}\int_0^x z\cdot\left(\frac{x}{z}\right)^{\frac{1}{2}-\gamma}\left[J_{\frac{1}{2}-\gamma}(\lambda^2x)J_{\gamma-\frac{1}{2}}(\lambda^2z)+J_{\gamma-\frac{1}{2}}(\lambda^2x)J_{\frac{1}{2}-\gamma}(\lambda^2z)\right]dz \qquad (16)$$

$$y(x)=C_3(-x)^{\frac{1}{2}-\gamma}I_{\frac{1}{2}-\gamma}(-\lambda^2x)+C_4(-x)^{\frac{1}{2}-\gamma}I_{\gamma-\frac{1}{2}}(-\lambda^2x)+$$

$$+\frac{\pi y(-x_0)}{2\cos\pi\gamma}\int_x^0(-z)\cdot\left(-\frac{x}{z}\right)^{\frac{1}{2}-\gamma}\left[I_{\frac{1}{2}-\gamma}(-\lambda^2x)I_{\gamma-\frac{1}{2}}(-\lambda^2z)-I_{\gamma-\frac{1}{2}}(-\lambda^2x)I_{\frac{1}{2}-\gamma}(-\lambda^2z)\right]dz$$

(17)

ko‘rinishda topamiz. (16) va (17) larga mos holda (x_0) va $(-x_0)$ larni qo’yib, $y(x_0)$ va $y(-x_0)$ larni quyidagi ko‘rinishda topamiz:

$$y(x_0)=\left[C_1x_0^{\frac{1}{2}-\gamma}J_{\frac{1}{2}-\gamma}(\lambda^2x_0)+C_2x_0^{\frac{1}{2}-\gamma}J_{\gamma-\frac{1}{2}}(\lambda^2x_0)\right]\times,$$

$$\times\left\{1-\frac{\pi}{2\cos\pi\gamma}\int_0^{x_0}\left(\frac{x_0}{z}\right)^{\frac{1}{2}-\gamma}z\left[J_{\frac{1}{2}-\gamma}(\lambda^2x_0)J_{\gamma-\frac{1}{2}}(\lambda^2z)+J_{\gamma-\frac{1}{2}}(\lambda^2x_0)J_{\frac{1}{2}-\gamma}(\lambda^2z)\right]dz\right\}^{-1}$$

(18)

$$y(-x_0)=\left[C_3x_0^{\frac{1}{2}-\gamma}I_{\frac{1}{2}-\gamma}(\lambda^2x_0)+C_4x_0^{\frac{1}{2}-\gamma}I_{\gamma-\frac{1}{2}}(\lambda^2x_0)\right]\times$$

$$\times\left\{1-\frac{\pi}{2\cos\pi\gamma}\int_{-x_0}^{0}\left(\frac{x_0}{z}\right)^{\frac{1}{2}-\gamma}(-z)\left[I_{\frac{1}{2}-\gamma}\left(\lambda^2x_0\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2x_0\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right]dz\right\}^{-1}$$

(19)

So‘ngra ularni (2) va (3) bo‘ysundirib

$$C_1=\frac{1}{J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)-I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)}\left\{\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\times\right.$$

$$\times\left[I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_0^T z^{\frac{1}{2}+\gamma}y(x_0)\left(J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2z\right)+J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)J_{\frac{1}{2}-\gamma}\left(\lambda^2z\right)\right)dz-\right.$$

$$\left.\left.-J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_{-T}^0(-z)^{\frac{1}{2}+\gamma}y(x_0)\left(I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right)dz\right]\right\}$$

$$C_2=\frac{1}{J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)-I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)}\left\{\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\times\right.$$

$$\times\left[I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_0^T z^{\frac{1}{2}-\gamma}y(x_0)\cdot\left(J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2z\right)+J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)J_{\frac{1}{2}-\gamma}\left(\lambda^2z\right)\right)dz-\right.$$

$$\left.\left.-J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)\int_{-T}^0(-z)^{\frac{1}{2}+\gamma}y(x_0)\left(I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right)dz\right]\right\}$$

$$C_3=\frac{1}{J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)-I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)}\left\{\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\times\right.$$

$$\times\left[I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_0^T z^{\frac{1}{2}+\gamma}y(-x_0)\left(J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2z\right)+J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)J_{\frac{1}{2}-\gamma}\left(\lambda^2z\right)\right)dz-\right.$$

$$\left.\left.-J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_{-T}^0(-z)^{\frac{1}{2}+\gamma}y(-x_0)\left(I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right)dz\right]\right\}$$

$$C_4=\frac{1}{J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)-I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)}\left\{\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\times\right.$$

$$\times\left[I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_0^T z^{\frac{1}{2}-\gamma}y(-x_0)\cdot\left(J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2z\right)+J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)J_{\frac{1}{2}-\gamma}\left(\lambda^2z\right)\right)dz-\right.$$

$$\left.\left.-J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)\int_{-T}^0(-z)^{\frac{1}{2}+\gamma}y(-x_0)\left(I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right)dz\right]\right\}$$

tengliklarga ega bo‘lamiz. So‘ngra (18) va (19) larni va $C_1, C_2 C_3 C_4$ lar uchun olingan yechimlarni (16) va (17) larga qo‘yib, {(1), (2), (3)} masalaning yechim quyidagicha ko‘rinishga keladi

$$y(x)=\left(\frac{1}{J_{\frac{1}{2}-\gamma}(\lambda^2T)I_{\gamma-\frac{1}{2}}(\lambda^2T)-I_{\frac{1}{2}-\gamma}(\lambda^2T)J_{\gamma-\frac{1}{2}}(\lambda^2T)}\times\right.$$

$$\times\left[\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\left[I_{\gamma-\frac{1}{2}}(\lambda^2T)\int_0^T z^{\frac{1}{2}+\gamma}y(x_0)\times\right.\right.$$

$$\times\left(J_{\frac{1}{2}-\gamma}(\lambda^2T)J_{\gamma-\frac{1}{2}}(\lambda^2z)+J_{\gamma-\frac{1}{2}}(\lambda^2T)J_{\frac{1}{2}-\gamma}(\lambda^2z)\right)dz-$$

$$\left.\left.-J_{\gamma-\frac{1}{2}}(\lambda^2T)\int_{-T}^0(-z)^{\frac{1}{2}+\gamma}y(x_0)\left(I_{\frac{1}{2}-\gamma}(\lambda^2T)I_{\gamma-\frac{1}{2}}(-\lambda^2z)-I_{\gamma-\frac{1}{2}}(\lambda^2T)I_{\frac{1}{2}-\gamma}(-\lambda^2z)\right)dz\right]\right]\times$$

$$\times x^{\frac{1}{2}-\gamma}J_{\frac{1}{2}-\gamma}(\lambda^2x)+\left(\frac{1}{J_{\frac{1}{2}-\gamma}(\lambda^2T)I_{\gamma-\frac{1}{2}}(\lambda^2T)-I_{\frac{1}{2}-\gamma}(\lambda^2T)J_{\gamma-\frac{1}{2}}(\lambda^2T)}\times\right.$$

$$\times\left[\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\left[I_{\gamma-\frac{1}{2}}(\lambda^2T)\int_0^T z^{\frac{1}{2}-\gamma}y(x_0)\times\right.\right.$$

$$\times\left(J_{\frac{1}{2}-\gamma}(\lambda^2T)J_{\gamma-\frac{1}{2}}(\lambda^2z)+J_{\gamma-\frac{1}{2}}(\lambda^2T)J_{\frac{1}{2}-\gamma}(\lambda^2z)\right)dz-$$

$$\left.\left.-J_{\frac{1}{2}-\gamma}(\lambda^2T)\int_{-T}^0(-z)^{\frac{1}{2}+\gamma}y(x_0)\left(I_{\frac{1}{2}-\gamma}(\lambda^2T)I_{\gamma-\frac{1}{2}}(-\lambda^2z)-I_{\gamma-\frac{1}{2}}(\lambda^2T)I_{\frac{1}{2}-\gamma}(-\lambda^2z)\right)dz\right]\right]\times$$

$$\times x^{\frac{1}{2}-\gamma}J_{\gamma-\frac{1}{2}}(\lambda^2x)+\frac{\pi y(x_0)}{2\cos\pi\gamma}\int_0^x z\cdot\left(\frac{x}{z}\right)^{\frac{1}{2}-\gamma}\left[J_{\frac{1}{2}-\gamma}(\lambda^2x)J_{\gamma-\frac{1}{2}}(\lambda^2z)+J_{\gamma-\frac{1}{2}}(\lambda^2x)J_{\frac{1}{2}-\gamma}(\lambda^2z)\right]dz$$

(20)

$$y(x)=\left(\frac{1}{J_{\frac{1}{2}-\gamma}(\lambda^2T)I_{\gamma-\frac{1}{2}}(\lambda^2T)-I_{\frac{1}{2}-\gamma}(\lambda^2T)J_{\gamma-\frac{1}{2}}(\lambda^2T)}\times\right.$$

$$\times\left[\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\left[I_{\gamma-\frac{1}{2}}(\lambda^2T)\int_0^T z^{\frac{1}{2}+\gamma}y(-x_0)\times\right.\right.$$

$$\left.\left(J_{\frac{1}{2}-\gamma}(\lambda^2T)J_{\gamma-\frac{1}{2}}(\lambda^2z)+J_{\gamma-\frac{1}{2}}(\lambda^2T)J_{\frac{1}{2}-\gamma}(\lambda^2z)\right)dz-\right.$$

$$-J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_{-T}^{0}(-z)^{\frac{1}{2}+\gamma}y(-x_0)\left(I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right)dz\Bigg]\Bigg]\Bigg)\times$$

$$\times(-x)^{\frac{1}{2}-\gamma}I_{\frac{1}{2}-\gamma}\left(-\lambda^2x\right)+\Bigg(\frac{1}{J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)-I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)}\times$$

$$\times\Bigg[\frac{k_1-k_2}{T^{\frac{1}{2}-\gamma}}-\frac{\pi}{2\cos\pi}\Bigg[I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)\int_0^T z^{\frac{1}{2}-\gamma}y(-x_0)\times$$

$$\times\left(J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)J_{\gamma-\frac{1}{2}}\left(\lambda^2z\right)+J_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)J_{\frac{1}{2}-\gamma}\left(\lambda^2z\right)\right)dz-$$

$$-J_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)\int_{-T}^{0}(-z)^{\frac{1}{2}+\gamma}y(-x_0)\left(I_{\frac{1}{2}-\gamma}\left(\lambda^2T\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(\lambda^2T\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right)dz\Bigg]\Bigg]\Bigg)+$$

$$+\frac{\pi y(-x_0)}{2\cos\pi\gamma}\int_x^0(-z)\cdot\left(-\frac{x}{z}\right)^{\frac{1}{2}-\gamma}\left[I_{\frac{1}{2}-\gamma}\left(-\lambda^2x\right)I_{\gamma-\frac{1}{2}}\left(-\lambda^2z\right)-I_{\gamma-\frac{1}{2}}\left(-\lambda^2x\right)I_{\frac{1}{2}-\gamma}\left(-\lambda^2z\right)\right]dz. \quad (21)$$

(20) va (21) lardan $y(x_0)$ va $y(-x_0)$ lar bir qiymatli topiladi.

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