



**MODELS AND METHODS FOR
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EXAMPLES ON THE CONSTRUCTION OF THE THE FUNCTION GREEN FOR n -ORDER HOMOGENEOUS DIFFERENTIAL EQUATIONS WITH BOUNDARY CONDITIONS

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Anotation. *In this article, the existence condition of the function Green for n -order homogeneous differential equations satisfying the given boundary conditions is given, and the solution of several examples of the construction of the function Green is explained.*

Keywords: *the function Grin, boundary value problem, continuous function, function with discontinuity of type 1, jump of function at a point, linear form, linear arbitrary system.*

CHEGARAVIY SHARTLARGA EGA n -TARTIBLI BIR JINSLI DIFFERENSIAL TENGLAMALAR UCHUN GRIN FUNKSIYASINI QURISHGA DOIR MISOLLAR

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Annotatsiya. *Ushbu maqolada berilgan chegaraviy shartlarni qanoatlantiruvchi n -tartibli bir jinsli differensial tenglamalar uchun Grin funksiyasining mavjudlik sharti keltirilgan hamda Grin funksiyasini tuzishga doir bir necha xil misollarni yechish tushuntirilgan.*

Kalit so'zlar: *Grin funksiyasi, chegaraviy masala, uzluksiz funksiya, 1-tur uzilishga ega funksiya, funksiyaning biror nuqtadagi sakrashi, chiziqli forma, chiziqli erkli sistema.*

This article explains the function Green and its construction procedure for n -order homogeneous differential equations with boundary conditions. The function



Green is an important tool for solving differential equations by reducing them to integral equations.

Let us be given an n -order homogeneous differential equation of the following form

$$L[y] \equiv \rho_0(x)y^{(n)} + \rho_1(x)y^{(n-1)} + \dots + \rho_n(x)y = 0 \quad (1)$$

Coefficients $\rho_0(x), \rho_1(x), \dots, \rho_n(x)$ in equation (1) are infinite continuous functions on the section $[a, b]$. Equation (1) has the following boundary conditions:

$$V_k(y) = \alpha_k y(a) + \alpha_k^{(1)} y'(a) + \dots + \alpha_k^{(n-1)} y^{(n-1)}(a) + \beta_k y(b) + \beta_k^{(1)} y'(b) + \dots + \beta_k^{(n-1)} y^{(n-1)}(b), \quad k = \overline{1, n}. \quad (2)$$

In this case, the equations V_1, V_2, \dots, V_n form a linear form. In them

$$y(a), y'(a), \dots, y^{(n-1)}(a); \\ y(b), y'(b), \dots, y^{(n-1)}(b)$$

systems form a linear system. We suppose that the boundary value problem (1)-(2) has only a trival solution.

Definition 1. [1] The function Green (effect function) constructed for the boundary value problem (1)-(2) is called $G(x, \xi)$ and is suitable for $\forall \xi \in (a, b)$ and has the following properties:

1°. The function $G(x, \xi)$ is continuous at $x \in [a, b]$, and has a continuous derivative up to $(n - 2)$ order with respect to the variable x ;

2°. The $(n - 1)$ derivative of this function with respect to the variable x has a type 1 discontinuity at the point $x = \xi$, and the jump at this point is equal to the value (12)

$$\left. \frac{\partial^{n-1} G(x, \xi)}{\partial x^{n-1}} \right|_{x=\xi+0} - \left. \frac{\partial^{n-1} G(x, \xi)}{\partial x^{n-1}} \right|_{x=\xi-0} = \frac{1}{\rho_0(\xi)} \quad (3)$$

and the jump at this point is equal to the value (3);

3°. In each of the intervals $[a, \xi]$ and $[\xi, b]$, $G(x, \xi)$ satisfies this equality $L[G]$;

4°. The function $G(x, \xi)$ satisfies (2)-boundary conditions

$$V_k(G) = 0, \quad k = \overline{1, n} \quad (4)$$

Theorem 1. [1] If the boundary value problems (1) and (2) have only a trival solution $y(x) \equiv 0$, then the function $G(x, \xi)$ for the operator L exists and is unique.

Now let's see examples of the function Green construction. First, we will give an example of the simplest type. We are given the following boundary value problem.

Example 1.

$$y''' = 0; \quad y(0) = y'(0) = 0, \quad y'(0) = y(1)$$



The simplicity of our examples is that its leading coefficient is 1 and the remaining coefficients are 0. Always, before solving the problem, we determine whether it is possible to construct a function Green for this boundary value problem. For this, we use Theorem 1 above. According to the condition of the theorem, the given higher-order homogeneous equation must have only a trival solution under the given boundary conditions. If this equation has at least one nonzero solution under the given boundary conditions, then it is impossible to construct a function Green for this differential equation. Initially

$$y'''' = 0$$

solve the equation and determine its general solution. We create a solution of the following form:

$$y = C_1 \frac{x^2}{2} + C_2 x + C_3$$

Now, using the boundary conditions, we determine the unknown coefficients of the solution. From the boundary conditions the relations

$$\begin{aligned} C_1 &= C \\ C_2 &= -\frac{3}{2}C_1 = -\frac{3}{2}C \\ C_3 &= -\frac{1}{2}C_1 = -\frac{1}{2}C \end{aligned}$$

are formed and it follows that the differential equation has infinitely many solutions.

Therefore, it is impossible to construct a function Green for this equation. Now let's look at the following example:

Example 2.

$$y^{(4)} = 0; \quad y(0) = y'(0) = y''(0) = y'''(0) = 0.$$

Generated

$$y = \frac{C_1}{6}x^3 + \frac{C_2}{2}x^2 + C_3x + C_4$$

by imposing boundary conditions on the general solution, we show that the differential equation has only zero solutions. So it is possible to construct the the function Green for the given differential equation with these boundary conditions. First, we construct a linearly independent system that constitutes the general solution. Since the function Green satisfies the boundary problem, its appearance must be the same as the solution of the differential equation.

$$y_1(x) = 1, \quad y_2(x) = x, \quad y_3(x) = x^2, \quad y_3(x) = x^3 \quad (5)$$



System (5) is a linear independent system. Now, using this general solution view, we can construct the function Green for the sections $0 \leq x \leq \xi$ and

$\xi \leq x \leq 1$ in the following form:

$$G(x, \xi) = a_1 \cdot 1 + a_2 x + a_3 x^2 + a_4 x^3, \quad \text{agar } 0 \leq x \leq \xi \text{ bo'lsa} \quad (6)$$

$$G(x, \xi) = b_1 \cdot 1 + b_2 x + b_3 x^2 + b_4 x^3, \quad \text{agar } \xi \leq x \leq 1 \text{ bo'lsa} \quad (7)$$

In equations (6) and (7), the coefficients $a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4$ are a continuous function of the variable ξ . For convenience, we introduce this notation $c_k = b_k - a_k$, and subtract the values of the expressions (6) and (7) themselves and their particular derivatives up to the $(n - 1)$ th order with respect to the variable x at the point $x = \xi$. According to the main property of the the function Green $G(x, \xi)$, the eigenderivatives of this function up to the $(n - 2)$ th order with respect to the variable x are continuous at the point $x = \xi$, but the $(n - 1)$ –order derivative is at the point $x = \xi$ 1-type has a break.

The jump at this point

$$\left. \frac{\partial^{n-1} G(x, \xi)}{\partial x^{n-1}} \right|_{x=\xi+0} - \left. \frac{\partial^{n-1} G(x, \xi)}{\partial x^{n-1}} \right|_{x=\xi-0} = \frac{1}{\rho_0(\xi)} \quad (8)$$

In equation (8), the function $\rho_0(x)$ is the leading coefficient of the n –order homogeneous differential equation. By performing the above operations, we create the following system of equations:

$$\begin{cases} c_1 + c_2 x + c_3 x^2 + c_4 x^3 = 0 \\ c_2 + 2c_3 x + 3c_4 x^2 = 0 \\ 2c_3 + 6c_4 x = 0 \\ 6c_4 = \frac{1}{\rho_0(x)} \end{cases} \quad (9)$$

The main coefficient of the boundary problem we are looking at is $\rho_0(x) = 1$. The resulting system of equations (9) at $x = \xi$ forms a system of unknown linear equations $c_k, k = \overline{1,4}$.

$$\begin{cases} c_1 + c_2 \xi + c_3 \xi^2 + c_4 \xi^3 = 0 \\ c_2 + 2c_3 \xi + 3c_4 \xi^2 = 0 \\ 2c_3 + 6c_4 \xi = 0 \\ 6c_4 = 1 \end{cases} \quad (10)$$

By solving the system of equations (10), we find the unknowns $c_k, k = \overline{1,4}$ depending on the variable ξ .



$$\left\{ \begin{array}{l} c_1 = \frac{5}{6} \xi^3 \\ c_2 = \frac{1}{2} \xi^2 \\ c_3 = -\frac{1}{2} \xi \\ c_4 = \frac{1}{6} \end{array} \right. \quad \left\{ \begin{array}{l} b_1 - a_1 = \frac{5}{6} \xi^3 \\ b_2 - a_2 = \frac{1}{2} \xi^2 \\ b_3 - a_3 = -\frac{1}{2} \xi \\ b_4 - a_4 = \frac{1}{6} \end{array} \right.$$

We created 4 equations related to the unknown coefficients of the function Green. We extend the resulting system with new equations derived by applying the boundary conditions to the function Green. In this case, we apply the values of the boundary conditions at the lower point of the segment $[a, b]$ to the first (6) expression of the function Green, and the values of the upper point to the second (7) expression. As a result, we create the following equations related to the unknown coefficients of the function Green:

$$\left\{ \begin{array}{l} a_1 = a_2 = 0 \\ 2b_3 + 6b_4 = 6b_4 = 0 \end{array} \right.$$

We solve the newly formed system of equations:

$$\left\{ \begin{array}{l} b_1 - a_1 = \frac{5}{6} \xi^3 \\ b_2 - a_2 = \frac{1}{2} \xi^2 \\ b_3 - a_3 = -\frac{1}{2} \xi \\ b_4 - a_4 = \frac{1}{6} \\ a_1 = a_2 = 0 \\ 2b_3 + 6b_4 = 6b_4 = 0 \end{array} \right. \quad (11)$$

By solving the system (11), we determine all the unknown coefficients of the function Green and form the function Green as follows.

$$G(x, \xi) = \begin{cases} \frac{\xi}{2} x^2 - \frac{1}{6} x^3, & \text{agar } 0 \leq x \leq \xi \text{ bo'lsa} \\ \frac{5}{6} \xi^3 + \frac{\xi^2}{2} x, & \text{agar } \xi \leq x \leq 11 \text{ bo'lsa} \end{cases}$$

The function Green also be constructed in the above manner for the following boundary value problems:

- 1) $y'' = 0$; $y(0) = y'(0)$, $y'(0) = y(1)$
- 2) $y'' = 0$; $y(0) = y(1)$, $y'(0) = y'(1)$



- 3) $y'' + y = 0; y(0) = y(\pi) = 0,$
 4) $y^{(4)} = 0; y(0) = y'(0) = y''(1) = y'''(1) = 0$
 5) $y''' = 0; y(0) = y'(0) = 0, y'(0) = y(1)$
 6) $y''' = 0; y(0) = y(1) = 0, y'(0) = y'(1)$
 7) $y'' = 0; y(0) = 0, y'(1) = y(1)$
 8) $y'' + y' = 0; y(0) = y(1) = 0, y'(0) = y'(1)$
 9) $y'' - k^2y = 0; (k \neq 0), y(0) = y(1) = 0$
 10) $y'' + y = 0; y(0) = y(1), y'(0) = y'(1)$
 11) $y''' = 0; y(0) = y(1), y'(0) = y'(1)$

REFERENCES

1. М.Л.Краснов, А.И.Киселов, Г.И.Макаренко, Интегральные уравнения, М.:Едиториал УРСС, 2003.-192 с.
2. Сайлиева Г.Р. (2021). Использование новых педагогических технологий в обучении «Аналитическая геометрия». Вестник науки и образования. 68-71.
3. Г.Р Сайлиева, Использование метода «математический рынок» в организации практических занятий по «дискретной математике», Проблемы педагогики. 53(2), 27-30.
4. Р.Т.Мухитдинов, М.А.Абдуллаева. Эргодические свойства мер, порожденных одним классом квадратичных операторов// Проблемы науки, 4(63), 2021/4/26, 16-19
5. Sayliyeva G.R., Diskret matematika va matematik mantiq fanining «predikatlar mantiq'i» bobi mavzularini tushuntirishda samarali yondashuv va undagi zamonaviy usul va metodlar, scientific progress. 2:1, 552-558.
6. Р.Т. Мухитдинов, М.А.Абдуллаева. Крайние точки множества квадратичных операторов, определенных на S^1 // Scientific progress, 2(1), 2021. 470-477
7. Sayliyeva G.R., Sharipova S.A. (2022). Ehtimollar nazariyasi va matematik statistika fanida «Daraxt ko'rki» va «Talaba hayoti va ehtimolliklar». Образование и наука в XXI веке. Центр научных публикаций (buxdu. uz). 8 (8), 25(4), 1493-1502.
8. Р.Т.Мухитдинов, М.А.бдуллаева. Гипергеометрик тенглама, унинг ечимлари ва гипергеометрик функциялар ҳақида// Science and Education, 2(11). 2021, 128-140



9. Sayliyeva G., Sharipov I. Kompleks sonlar" mavzusini o'qitishda" bumerang" texnologiyasi, Образование и наука в XXI веке. 25(4).

10. M.Abdullayeva, Применение метода «светофор» при преподавание темы «определитель и их свойства. Понятие определителя и ее вычисления», центр научных публикаций (buxdu. uz): Том 8 № 8 (2021): Maqola va tezislar (buxdu. uz)

11. Сайлиева Г.Р. (2022), Использование метода «Определения, теоремы, дока-зательства, формулы, примера». Образование и наука в XXI веке, Центр научных публикаций (buxdu. uz). 8 (8), 25(4), 1569-1579 с.

12. Sayliyeva G.R., Diskret matematika va matematik mantiq fanida bul funksiyalarni jegalkin ko'phadlariga yoyish mavzusini mustahkamlashda «matematik domino» metodidan foydalanish, Scientific progress, 2(2), 2021, 773-780.

13. Sayliyeva G.R., Yahyoyeva Sh.M. (2022). Interfaol usullarni qo'llab funksiyaning differensial va uni taqribiy hisoblashga doir misollar yechish. Образование и наука в XXI веке. Центр научных публикаций (buxdu. uz) 8 (8). 25(4), 1580-1590.

14. Sayliyeva G., Salimov F. ko'phaddagi hadlar soni va koeffitsiyentini aniqlashda " Zinama-zina" va" Charxpalak" metodlaridan foydalanish, Образование и наука в XXI веке. Центр научных публикаций (buxdu. uz) 8 (8). 25(4),1484-1493.

15. Sayliyeva G. Diskret matematika va matematik mantiq fanining amaliyot darslarida o`tilgan mavzuni mustahkamlashda "G`oyaviy charxpalak", "Charxpalak" texnologiyasi va "Assotsatsiyalar" metodlaridan foydalanish, Pedagogik mahorat, Центр научных публикаций (buxdu. uz). 8 (8),

16. G.R.Sayliyeva, M.M.Nurilloeva, Hardi tengsizligi va uning baholanishi, Science and education, may 2023/ Volume 4, Issue 5, (58-64-b.).

17. G.R.Sayliyeva, S.A.Sharipova, AW^* – faktorlarning tuzilishi, Science and education, may 2023/ Volume 4, Issue 5, (22-28-b.).

18. G.Sayliyeva, Talabalarni o`qitilayotgan fanlarga qiziqishini oshirishda foydalaniladigan samarali pedagogik metodlar, Pedagogik mahorat11-son, 2023-yil, dekabr, Центр научных публикаций (buxdu. uz), 44.

19. G.R.Sayliyeva, The first type is some of the important types of the Fredholm integral and Methods for solving them, Tadqiqotlar,15-son, 2-to'plam, Центр научных публикаций (buxdu. uz),38.

