TENGLAMALARNI YECHISHNING BA'ZI SUN'IY USULLARI

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Annotatsiya: *Ushbu maqolada ba'zi algebraik tenglamalarni yechishda tenglamani funksiyaga ko'paytirish va funksiya superpozitsiyasidan foydalanish haqida ma'lumotlar berilgan.*

Kalit so'zlar: *algebraik tenglamalar, tenglamani funksiyaga ko'paytirish, funksiya superpozitsiya, sun'iy usullar, abstrakt tasavvur*.

НЕКОТОРЫЕ ИСКУССТВЕННЫЕ МЕТОДЫ РЕШЕНИЯ УРАВНЕНИЙ

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Аннотация: *В этой статье содержится информация об умножении уравнения на функцию и использовании суперпозиции функции для решения некоторых алгебраических уравнений.*

Ключевые слова: *алгебраические уравнения, умножение уравнения на функцию, суперпозиция функций, искусственные методы, абстрактное воображение.*

SOME ARTIFICIAL METHODS OF SOLVING EQUATIONS

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Abstract: *This article provides information on multiplying an equation by a function and using superposition of a function to solve some algebraic equations.*

Key words: *algebraic equations, multiplying an equation by a function, function superposition, artificial methods, abstract imagination*.

Iqtidorli va intiluvchan talabalarni matematika faniga bo'lgan qiziqishlarini orttirishda algebraik tenglamalarni yechishning turli sun'iy usullarini o'rgatish muhimdir. Ushbu maqolada keltirilgan tenglamalar talabalarning mustaqil ravishda bilim saviyalarini oshirishi, izchil, mantiqiy fikrlashni shakllantirishi, abstrakt tasavvurini hosil bo'lishi va rivojlanishida yordam beradi.

1.Tenglamani funksiyaga ko'paytirish.

Ba'zi hollarda algebraik tenglamalarni yechishda tenglamaning har ikkala tomonini biror funksiyaga ya'ni o'zgaruvchiga bog'liq ko'phadga ko'paytirish ishni ancha osonlashtiradi. Bunday hollarda tenglamani yechish jarayonida tenglamani ko'paytirgan ko'phadlarimizning ildizlari chet ildizlar bo'lib paydo bo'lishi mumkin. Shuning uchun tenglamani ildizi yo'q ko'phadga ko'paytirishimiz yoki ildizi bor ko'phadga ko'paytirganimizda ham bu ildizlarni berilgan tenglamaga qo'yib ildizi bo'lishi yoki bo'lmasligini tekshirib ko'rishimiz kerak.

1-misol. Ushbu $x^8-x^6+x^4-x^2+1=0$ tenglamani yeching.

Yechish. Berilgan tenglamaning har ikkala tomonini x^2+1 ko'phadga ko'paytiramiz.

$$(x^2+1)(x^8-x^6+x^4-x^2+1)=0 \qquad (1)$$

(1) tenglamani quyidagi ko'rinishda yozish mumkin

$$x^{10}+1=0 \qquad (2)$$

(2) tenglama haqiqiy ildizga ega bo'lmaganligi uchun berilgan tenglama ham ildizga ega bo'lmaydi.

Javob: $\varnothing$

2-misol. Ushbu $6x^3-x^2-20x+12=0$ tenglamani yeching.

Yechish. Tenglamaning har ikkala tomonini $x+\frac{1}{2}$ ko'phadga ko'paytiramiz va quyidagi

$$6x^4+2x^3-\frac{41}{2}x^2+2x+6=0 \qquad (3)$$

tenglamani hosil qilamiz.

(3) tenglama $x=-\frac{1}{2}$ ildizga ega bo'lib, bu berilgan tenglamaning ildizi bo'lmaydi.

(3) tenglama 4-darajali simmetrik tenglamadir. x=0 (3) tenglamaning ildizi bo'lmaydi. Uning har ikkala tomonini $2x^2$ ga bo'lib hadlarini gruppalab

$$3\left(x^2+\frac{1}{x^2}\right)+\left(x+\frac{1}{x}\right)-\frac{41}{4}=0 \qquad (4)$$

(3) tenglamaga teng kuchli tenglamani hosil qilamiz.

$y=x+\frac{1}{x}$ almashtirish bajarib (4) tenglamani

$$3y^2+y-\frac{65}{4}=0 \qquad (5)$$

ko'rinishda yozamiz. (5) tenglama 2 ta ildizga ega

$$y_1=-\frac{5}{2} \quad \text{va} \quad y_2=13/6$$

Shuning uchun (4) tenglama quyidagi tenglamalar majmuasiga teng kuchli

$$x+\frac{1}{x}=\frac{13}{6} \quad \text{va} \quad x+\frac{1}{x}=-\frac{5}{2}$$

Bu tenglamalami yechib (4) tenglamaning 4 ta ildizini topamiz.

$$x_1=\frac{2}{3},\quad x_2=\frac{3}{2},\quad x_3=-2,\quad x_4=-\frac{1}{2}$$

$x_4=-\frac{1}{2}$ ildiz (3) tenglama uchun chet ildiz. Bundan esa (3) tenglama 3 ta ildizga ega ekan degan xulosaga kelamiz.

J: $x_1=\frac{2}{3},\quad x_2=\frac{3}{2},\quad x_3=-2.$

2-misolni yechish jarayonida qo'llagan usulimiz ya'ni berilgan tenglamani biror ko'phadga ko'paytirish natijasida qaytma yoki simmetrik tenglamaga ega bo'lamiz.

Xuddi shunday usul bilan

$$ax^3+bx^2+cx+d=0 \qquad (6)$$

ko'rinishdagi tenglamalami yechish mumkin. Bunda $a\neq0$, $d\neq0$, $c\neq a$, $a(c-a)=d(b-d)$

Bu tenglamani $x+\frac{\alpha}{d}$ ko'phadga ko'paytirib 4-darajali simmetrik tenglamani hosil qilamiz. Bu tenglama ildizlari orasida $x=-\frac{\alpha}{d}$ ham bo'lib, u (6) tenglama uchun chet ildiz bo'lishi mumkin.

2.Funktsiya superpozitsiyasidan foydalanish.

3-misol. Ushbu $(x^2+2x-5)^2+2(x^2+2x-5)-5=x$ tenglamani yeching.

Yechish. $f(x)=x^2+2x-5$ deb belgilash kiritsak, berilgan tenglamani $f(f(x))=x$ ko'rinishda yozish mumkin

f(x)=r tenglamaning ildizi bo'lsa, u holda f(f(x))=x tenglamaning ham ildizi bo'ladi. $x^2+2x-5=x$ tenglama ildizlari $x_1=\frac{-1+\sqrt{21}}{2}$ va $x_2=\frac{-1-\sqrt{21}}{2}$

Natijada berilgan tenglama ham bu ildizlarga ega. Berilgan tenglamani

$$x^4+4x^3-4x^2-17x+10=0 \qquad (7)$$

ko'rinishda yozamiz.

$x^4+4x^3-4x^2-17x+10$ ko'phadni $(x-x_1)(x-x_2)$ ko'phadga bo'lib (7) tenglamani $(x^2+x-5)(x^2+3x-2)=0$ ko'rinishda yozamiz. Berilgan tenglamaning ildizlari x_1 va x_2 lar bilan bir qatorda $x^2+3x-2=0$ tenglamaning ildizlari $x_3=\frac{-3+\sqrt{17}}{2}$ va $x_4=\frac{-3-\sqrt{17}}{2}$ lar ham bo'ladi.

J: $x_1=\frac{-1+\sqrt{21}}{2}$; $x_1=\frac{-1-\sqrt{21}}{2}$; $x_3=\frac{-3+\sqrt{17}}{2}$; $x_4=\frac{-3-\sqrt{17}}{2}$.

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