0Impact Factor: 9.9 ISSN-L: 2544-980X

SONNING BUTUN VA KASR QISMI TUSHUNCHASI VA UNING TADBIQLARI

Raxmonov Baxodir Abduhomidovich
Iqtisodiyot va pedagogika Universiteti, Umummetodologik fanlar kafedrasi o'qituvchisi
+998 97 552 55 59
https://orcid.org/0009-0008-5655-448X
boxodir1@bk.ru

Annotatsiya : *Matematikaning ko'pgina tadbiqlarida haqiqiy sonning butun qismi va kasr qismi tushunchasi bilan ish ko'rishga to'g'ri keladi. Ushbu ishda sonning butun va kasr qism tushunchasi va uning tatdiqlari o'rganilgan.*

Kalit so'zlar: *butun qism, kasr qism, tub son, tub ko'paytuvchi.*

Ta'rif – 1. x haqiqiy sonning butun qismi deb, x dan oshmaydigan eng kata butun songa aytiladi va u $[x]$ simvol orqali belgilanadi.

Masalan: $[4,3]=4,\ [\pi]=3, [-5,2]=-6, [-\pi]=-4$

$f(x)=[x]$ funksiyaning xossalari:

$1^o.$ $D[x]=R'=(-\infty,\infty)-$ barcha haqiqiy sonlar to'plami;

$2^o.$ $E[x]=Z-$ barcha butun sonlar to'plami;

$3^o.$ $\forall x_1,x_2$ haqiqiy sonlar uchun $[x_1+x_2]\geq[x_1]+[x_2];$

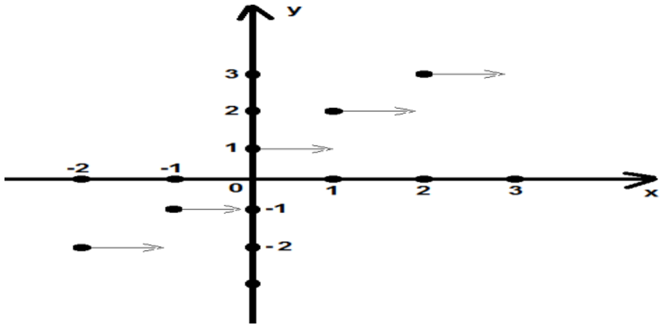
$4^o.$ $\forall x\in R, \forall n\in Z$ uchun $[x+n]=[x]+n;$

$5^o.$ Agar $[x]=[y]$ bo'lsa, $|x-y|<1.$

$6^o.$ $\forall x$ haqiqiy son uchun $[x]\leq x<[x]+1;$

$7^o.$ $\forall n\in N, \forall x\in R$ uchun $\left[\frac{[x]}{n}\right]=\left[\frac{x}{n}\right].$

Bu funksiya x ning barcha butun qiymatlarida uzilishga ega bo'ladi va grafigi 1-chizmadan iborat.



1-chizma.

<u>Ta'rif – 2.</u> *x* ning haqiqiy sonning kasr qismi deb, *x* bilan uning $[x]$ butun qismi orasidagi ayirmaga aytiladi va u $\{x\}$ simvol bilan belgilanadi. Demak, $\{x\} = x - [x]$.

Masalan: $\{4,3\} = 4,3 - [4,3] = 4,3 - 4 = 0,3$ $\{-5,2\} = -5,2 - [-5,2] = -5,2 + 6 = 0,8$

Ravshanki, har qanday *x* sonini uning butun va kasr qismlari yig'indisi ko'rinishida tasvirlash mumkin: $x = [x] + \{x\}$.

$g(x) = \{x\}$ funksiyaning xossalari:

1^o. $D\{x\} = R = (-\infty, \infty)$;

2^o. $E\{x\} = (0;1]$

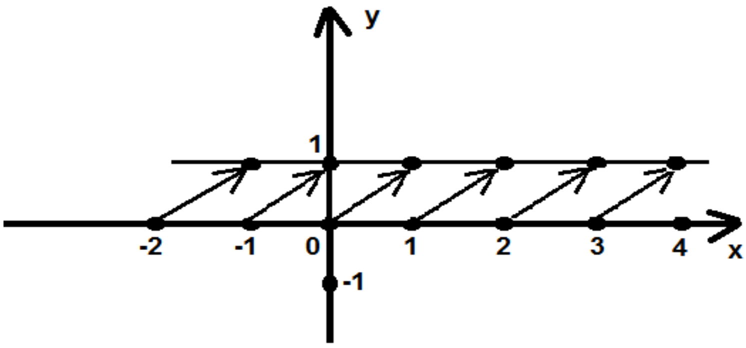
3^o. $\forall x$ haqiqiy son uchun $\{[x]\} = 0$ va $[\{x\}] = 0$, shuningdek $[[x]] = [x]$, $\{\{x\}\} = \{x\}$ tengliklar o'rinli.

4^o. $g(x) = \{x\}$ funksiya asosiy davri $T = 1$ ga teng davriy funksiyadir, ya'ni

$\{x\} = \{x+1\}$

tenglik istalgan *x* haqiqiy son uchun bajariladi, $\forall n \in Z$ uchun $\{x+n\} = \{x\} + n$.

5^o. $\{x\} = \{y\}$ bo'lsa, $x - y$ ayirma butun son bo'ladi. Bu funksiya *x* ning barcha butun qiymatlarida uzilishga ega bo'ladi va grafigi 2-chizmadan iborat.



2-chizma.

Misollar qarayliz.

<u>1-misol.</u> Ushbu $[x + [x]] = 113$ tenglamani yeching.

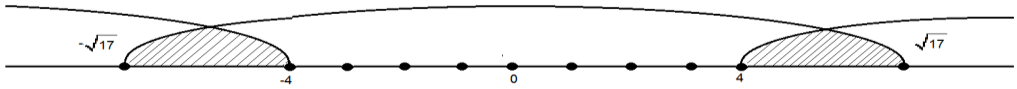
<u>Yechilishi:</u> $[x+n] = [x] + n$ munosabatga asosan $[x + [x]] = [x] + [x] = 2 \cdot [x]$ juft son bo'lib, u 113 ga teng bo'lishi mumkin emas. demak, tenglamaning yechi yo'q.

2-misol. $\left[x^2\right]=16$ tendlamaning.

Yechilishi: Ravshanki, $16\le x^2<17$ bo'ladi. Bu tenglamalarni yechamiz.

$x^2\ge16$ $\quad (x-4)(x=4)\ge0\Rightarrow(-\infty;-4]\cup[4;\infty)$

$x^2<17,$ $\quad \left(x-\sqrt{17}\right)\left(x+\sqrt{17}\right)<0 \ \Rightarrow-\sqrt{17}<\infty<\sqrt{17}$



Javob: $\left(-\sqrt{17};-4\right]\cup\left[4;\sqrt{17}\right)$

3-misol. $x^2 2\{x\}-5=0$ tenglamani eching.

Yechilishi: Agar $0\le\{x\}<1$ ni etiborga olsak, berilgan. $2\{x\}=x^2-5,\ \ 5\le x^2<7,$

Yoki $\sqrt{5}\le|x|<\sqrt{7}$ bundan $[x]=2$ yoki $[x]=-3$ bo'lib, $\{x\}=x-[x]$ tenglikka asosan berilgan tenglamani ushbu ikkita tenglamani yechishga keltiramiz:

$1^o.\ x^2-2(x-2)-5=0,\ \ 2^o.\ x^2-2(x+3)-5=0.$

Birinchi tenglamani yechib: $x_{1,2}=1\pm\sqrt{2}$ ni hosil qilamiz $[x]=2$ shartni $x=1+\sqrt{2}$ ildiz qanoatlantiradi. Ikkichi tenglamani yechib $[x]=-3$ shatrni qanoatlantiradi $x=1-2\sqrt{3}$ ildizni hosil qilamiz.

Javob: $x=1+\sqrt{2}$ va $x=1-2\sqrt{3}.$

4-misol. $\left[\frac{x}{3}\right]^2-3\left[\frac{x}{3}\right]-4=0$ tenglamani qanoatlantiruvchi nechta turli butun son bor?

Yechilishi: Agar $\left[\frac{x}{3}\right]=t$ desak, u holda $t^2-3t-4=0$ tenlama hosil bo'ladi, uni yechib $t_1=-1,\ \ t_2=4$ ildizlarni topamiz, natijada

$\left[\frac{x}{3}\right]=-1$ va $\left[\frac{x}{3}\right]=4$ tenglamalar hosil bo'ladi. Tarifga asosan bu tenglamalarni yechsak:

$-1\le\frac{x}{3}<0,\quad -3\le x<0,$ x: -3; -2; -1.

$4\le\frac{x}{3}<5,\quad 12\le x<15,$ x: 12, 13, 14.

Javob: -3; -2; -1; 12; 13; 14 yani, berilgan tenglamani qanoatlantiruvchi butun sonlar 6 ta ekan.

5-misol. $\left[\left[\frac{x+2}{3}\right]\right]=2$ bo'lsa, quyidagilarning qaysi biri to'g'ri?

A) $8\le x<11$ B) $7\le x<10$ C) $6\le x<9$ D) $5\le x<8$ E) $4\le x<7.$

Yechilishi: $[[x]]=[x]$ tenglikka asosan, $\left[\frac{x+2}{3}\right]=2$ tenglikka ega bo'lamiz, haqiqiy sonning butun qismining xossasiga ko'ra $2\le\frac{x+2}{3}<3$ tenglikka ega bo'lamiz, uni yechib $4\le x<7$ yechimini hosil qilamiz.

Javob: E) $4\le x<7.$

6-misol. 30 dan kata bo'lmagan barcha nuqtalar sonlarning ko'paytmasi $k(k\in N)$ ning qanday eng katta qiymatida 2^k ga qoldiqsiz bo'linadi?

Yechilishi: Sonning butun qismi qo'llaniladigan quyudagi lejandr teoremasini qaraymiz:

Teorema: $p\, tub$ soni n! soning tub ko'paytuvchilariga yoyilmasida $\left[\frac{n}{p}\right]+\left[\frac{n}{p^2}\right]+\left[\frac{n}{p^3}\right]+....$ daraja ko'rsatgichi bilan qatnashadi, yetarli kata R lar $(k\to\infty)$ uchun $\left[\frac{n}{p^k}\right]=0$ Endi $1\cdot2\cdot3..........30$ ko'paytmada 2 tub ko'paytuvchi necha marta qatnashishini nisoblaymiz: Lejandr teoremasiga binoan

$$\left[\frac{30}{2}\right]+\left[\frac{30}{2^2}\right]+\left[\frac{30}{2^3}\right]+\left[\frac{30}{2^4}\right]=15+7+3+1=26.$$

Javob: k=26.

7-misol. $[\lg x]\cdot\{\lg x\}=\lg x$ tenglamani yeching.

Yechilishi: Deylik, $[\lg x]=n,$ $n\in Z$ va $\{\lg x\}=d,\ 0\le\alpha<1$ bo'lsin. U holda $\lg x=[\lg x]+\{\lg x\}$ formulaga asosan $\lg x=\ n+\alpha$ bo'ladi. Berilgan tenglamadan esa $n\cdot\alpha=n+\alpha$ tenglikka ega bo'lamiz, bu yerdan $n=\frac{\alpha}{\alpha-1}$ yoki $\alpha=\frac{n}{n-1}.$ ni topamiz. $n\le0,n\in Z$ ekanligi kelib chiqadi. Shunday qilib, $\lg x=\frac{n^2}{n-1}$, bundan esa $x=10^{\frac{n^2}{n-1}}$ hosil bo'ladi.

Javob: $x=10^{\frac{n^2}{n-1}},\ n\le0,\ n\in Z.$

Xulosa o'rnida shuni aytish mumkinki, haqiqiy sonning butun va kasr qismi tushunchalarining tadbiqlarikengayib bormoqda, sababdan ham bu tushunchalarni va ular bilan bog'liq barcha bog'lanishlarni o'rganish dolzarb masaladir.

Foydalanilgan adabiyotlar.

1. Shoimov B.S, Bozorov M.N. Boundary value problem in lower semifields deviating from characteristics for a parabolic–hyperbolic equation. *Miasto Przyszłości*, Kielce 2023 Impact Factor: 9.2. ISSN-L:2544-980X [331-338]
2. Shoimov B.S, Bozorov M.N. Banax fazosida oshkormas va teskari funksiya. "Golden Brain" Scientific Journal. ISSN:2181-4120 2023/29 October [14-24] https://doi.org/10.5281/zenodo.10041498.

3. Shoimov B.S, Bozorov M.N. Parabolik–giperbolik tipdagi tenglamalar uchun xarakteristikadan siljigan chiziqlarni o`z ichiga olgan quyi yarim sohada chegaraviy masala "Golden Brain" Scientific Journal. ISSN:2181-4120 2023/29 October [4-13] https://doi.org/10.5281/zenodo.10041479
4. Shoimov B.S Parabolik–giperbolik tipdagi tenglamalar uchun xarakteristikadan siljigan chiziqlarni o`z ichiga olgan sohalarda chegaraviy masala. Namangan Davlat Universitetining ilmiy axborotnomasi 2022-yil 6-son
5. Shoimov B.S, Jamolov. Sh. Singulyar koeffitsientga ega bo'lgan giperbolik tipdagi tenglama uchun Koshi masalasi. Buxoro Davlat Universitetining ilmiy axborotnomasi 2023-yil 2-son.
6. Shoimov B.S, Bozorov M.N. Trigonometrik funksiyalarni funksional tenglamalar yordamida aniqlash. "Jornal of new century innovations" https://www.newjournal.org/index.php/new/article/view/12395.
7. 7.Bozorov, M. N. (2023). PARABOLIK–GIPERBOLIK TIPDAGI TENGLAMALAR UCHUN XARAKTERISTIKADAN SILJIGAN CHIZIQLARNI O 'Z ICHIGA OLGAN QUYI YARIM SOHADA CHEGARAVIY MASALA. *GOLDEN BRAIN*, *1*(29), 4-13.