FUNKSIYA GRAFIGINI YASASHDA EKSTREMUMNING QO'LLANILISHI.

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ABSTRACT

Biz funksiya grafigini nuqtalar bo'yicha yasashni bilamiz. Agar yetarlicha ko'p sondagi sondagi nuqtalar belgilangan bo'lsa, ko'p hollarda bu usul yaxshi natijalar beradi. Ammo bunda funksiyalar qiymatlarining katta jadvallarini tuzishga to'g'ri keladi, eng asosiysi bunda funksiyalarning muhim xususiyatlarini payqamay qolish va natijada grafikni yasashda hatoga yo'l qo'yish mumkin.

Funksiyaning 15 ta nuqtadagi qiymatlarini hisoblab va grafikning koordinatalar tekisligidagi mos nuqtalarini belgilab, biz rasmni hosil qilamiz deb faraz qilaylik.Grafikning eskizi bu nuqtalarning hammasidan o'tuvchi uzluksiz egri chiziqqa yaqin deb faraz qilish tabiiy. Ammo "haqiqiy" grafik mutlaqo bu eskizga o'xshamasligi mumkin.

Xatodan qochish uchun funksiyaning harakterli hususiyatlarini ochishni o'rganib olish kerak, ya'ni uni oldin tekshirib ko'rish lozim. f funksiya haqida bizga quyidagilar malum bo'lsin:

$-(-\infty;\ -10),\ (-10;\ 10)\ \ (10;\ \infty)$

oraliqlarning birlashmasida aniqlangan .-(-11) va 0 nuqtalarda nolga aylanadi$(-\infty;\ -11)$ $(-\infty;\ -11)$ va $(-10;0)(-10;0)$ intervallarda manfiy hamda $(-11;\ -10)\ \ (0;10)$ $(-11;\ -10)\ \ (0;10)$ va $(10;-\infty)(10;-\infty)$ intervallarda musbat.

$-(-\infty;\ -10)\ (-10;\ \ 10)\ [12;15]-(-\infty;\ -10)\ (-10;\ \ 10)\ [12;15]$oraliqlarda o'suvchi, $(10;12]\ \ (10;12]$ va $[15;\ \infty)[15;\ \infty)$oraliqlarda kamayuvchi

-12 nuqtada minimumga ega, shu bilan birga $f(12) = 16f(12) = 16$

15 nuqtada maksimumga ega, shu bilan birga $f(15) = 19f(15) = 19$

- nihoyat, argument qiymatlari -10 va 10 ga yaqinlashganda ff funksiyaning qiymatlari absolyut kattaligi bo'yicha cheksiz o'sadi.

Bu ma'lumotlar funksiya grafigining eskizi taxminan 53-rasmda tasvirlanganidek ekanini kuzatishimiz mumkin.

Yana bitta funksiyani grafigini yasashga urinib ko'ramiz.

1-misol. $f(x) = \frac{1}{x^2+1} f(x) = \frac{1}{x^2+1}$ funksiyani grafigini chizing.

1) Funksiyaning aniqlanish sohasini topamiz.Ushbu holda $D(f)D(f)$sonlar to'g'ri chizig'idan iborat, chunki maxraj $x^2+1\ x^2+1$ nolga aylanmaydi.

2) $f(x)f(x)$ funksiya juft funksiya ekanini ko'ramiz: chunki har qanday xx uchun

$$f(-x)=\frac{1}{(-x)^2+1}=\frac{1}{x^2+1}=f(x)f(-x)=\frac{1}{(-x)^2+1}=\frac{1}{x^2+1}=f(x)$$

Shu sababli funksiyani tekshirish va $x\geq 0x\geq 0$ da uning grafigini yasash yetarli, keyin esa yasalgan grafikni ordinatalar o'qiga nisbatan akslantirish qoladi.

3) ff funksiya grafigining koordinatalar o'qlari bilan kesishish nuqtalarini ropamiz. ff ning grafigi ordinatalar o'qini $(0;f(x))(0;f(x))$nuqtada kesib o'tadi$f(0)f(0)$ning qiymati 1 ga teng . Shu sababli grafik$(0;1)(0;1)$ nuqtadan o'tadi.

ff funksiya grafigining absissalar o'qi bilan kesishish nuqtasini topish uchun $f(x)=0$ $f(x)=0$ tenglamani yechish kerak (uning ildizlari funksiyaning nollari deyiladi). $\frac{1}{x^2+1}=0\frac{1}{x^2+1}=0$ tenglama ildizlarga ega emas. Demak, ff ning grafigi absissalar o'qi bilan kesishmaydi.

4) ff funksiya qanday oraliqlarda musbat, qanday oraliqlarda manfiy qiymatlarni qabul qilishini aniqlaymiz; bu oraliqlar funksiyaning ishorasi o'zgarmaydigan oraliqlari deyiladi. Bu oraliqlarda funksiyaning grafigi absissalar o'qidan yuqorida (mos ravishda pastda) yotadi. Mazkur holda, har qanday $x\ x$ da x^2+1x^2+1 ning qiymati musbat bo'ladigan, sonlar to'g'ri chizig'ining hamma yerida $f(x)>0f(x)>0$ bo'ladi.

5) ff funksiya qanday oraliqlarda o'suvchi yoki qanday oraliqlarda kamayuvchi ekanligi haqidagi ma'lumotlar (bu oraliqlar funksiyaning o'sish yoki kamayish oralilari deyiladi) uning grafigini yasashni jiddiy osonlashtiradi. Qaralayorgan funksiya uchun o'sish oralig'I $(-\infty;0)(-\infty;0)$ dan, kamayish oralig'I esa $[0;\infty)[0;\infty)$ dan iborat.

6) Funksiyaning o'sishdan kamayishga o'tish yoki kamayishdan o'sishga o'tish nuqtalaridagi qiymatlarini topamiz. Qaralayotgan holda ham o'sish oralig'iga, ham kamayish oralig'iga tegishli bitta nuqta mavjud bu 0 nuqtadir 0 nuqta funksiyaning maksimum nuqtasidir. $f(0)=1f(0)=1$

7) qayd qilishimiz joizki xx ning qiymati cheksiz kattalashib borganda $x^2+1\ x^2+1$ ning qiymati cheksiz ortib boradi, shuning uchun ham $f(x)=\frac{1}{x^2+1}$ $f(x)=\frac{1}{x^2+1}$ ning qiymatlari (musbatligicha qolib) nolga yaqinlasha boradi.

Tekshirishning boshida $f(x)=\frac{1}{x^2+1}f(x)=\frac{1}{x^2+1}$ funksiya hossalari haqida olingan ma'lumotlar uning grafigini yasash uchun yetarlidir.

Grafikning $(0;1)(0;1)$ niqtasini yasaymiz. Biz $[0;\infty)[0;\infty)$ oraliq ff funksiyaning kamayish oralig'i ekanini aniqladik. Shu sababli absisaasi 0 ga teng nuqtadan o'ngroqda

ff funksiya grafigini "pastga keyadigan" egri chiziq shaklida chizamiz. (54-rasm) Har qanday xx da $f(x) > 0f(x) > 0$ bo'lgani uchun bu egri chiziq absissalar o'qidan pastga tushib keta olmaydi, shu bilan birga o'ngga davom ettirganda grafik absissalar o'qiga cheksiz yaqinlashib boradi. ff funksiyaning juftligidan foydalanish qoladi: $x \geq 0$ $x \geq 0$ uchun yasalgan egri chiziqni ordinatalar o'qiga nisbatan simmeterik akslantirib, f f funksiya grafigini hosil qilamiz. (55- rasm)

Umumlashtirgan holda quyidagi hulosalarga kelish mumkin.

1) Berilgan f funksiyaning aniqlanish va qiymatlar sohalarini topish

2) Funksiyani tekshirishni osonlashtiruvchi hususiyatlarga ega yoki ega emasligini aniqlash, ya'ni ff funksiya

a) toq yoki juft funksiya ekani

b) davriy funksiya ekani aniqlanadi.

3) Grafikning koordinatalar o'qlari bilan kesishish nuqtalarini hisoblash.

4) ff funksiyaning ishorasi o'zgarmaydigan oraliqlarni topish.

5) ff funksiya qanday oraliqlarda o'suvchi, qanday oraliqlarda kamayuvchi ekanligini aniqlash.

6) funksiyaning ekstremum nuqtalarini topish, ekstremum turini (maksimum yoki minimum ekanligini) aniqlash va ff ning shu nuqtalardagi qiymatini hisoblash.

7) ff funksoyaning aniqlanish sohasiga kirmaydigan harakterli nuqtalarda (masalan $f(x) = \frac{1}{x} f(x) = \frac{1}{x}$ funksiya uchun $x = 0x = 0$ nuqtada) hamda argumentning (moduli bo'yicha) katta qiymatlarida funksiya holatini tekshirish kerak.

Shuni ta'kidlash zarurki, tekshirishning bu plani taxminiy harakterga ega. Masalan, absissalar o'qi bilan kesishish nuqtalarini topish uchun $f(x) = 0f(x) = 0$ tenglamani yechish kerak, biz esa $f(x)f(x)$ hatto beshinchi darajali ko'phad bo'lganda buning uddasidan chiqa olmaymiz. (to'g'ri, ko'p hollarda bunday tenglama ildizlari sonini ham, ildizlarning o'zini ham har qanday aniqlikda toppish imkonini beruvchi usullar mavjud). Shu sababli tekshirishning u yoki bu bosqichini tushurib qoldirishga to'g'r i keladi. Ammo funksiyalarni tekshirishning borishida imkoni boricha shu sxemaga amal qilish maqsadga muvofiq.

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