- Toshkent islom unversiteti ,,Fiqh iqtisod va tabiiy fanlar fakulteti ” informatika va axborot texnalogiya yo’nalishi 1-kurs talabasi Ahmedov Ulug’bekning oliy matematika fanidan bajargan ishi.

MAVZU:DERERMINANTLAR.

- Toshkent islom unversiteti ,,Fiqh iqtisod va tabiiy fanlar fakulteti ” informatika va axborot texnalogiya yo’nalishi 1-kurs talabasi Ahmedov Ulug’bekning oliy matematika fanidan bajargan ishi.

MAVZU:DERERMINANTLAR.

- $$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ 0 & 0 & 0 \end{vmatrix} = 0$$

b) Agar determinant ikkita bir xil parallel qatorga ega bo'lsa, uning qiymati 0 ga teng bo'ladi;

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{vmatrix} = 0$$

g) Agar determinantning ikkita parallel qatorining mos elementlari mutanosib (proporsional) bo'lsa, uning qiymati 0 ga teng bo'ladi;

$$\begin{vmatrix} 2a_{11} & 2a_{12} & 2a_{13} \\ 4a_{11} & 4a_{12} & 4a_{13} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = 0$$

d) Biror qator elementlarining umumiy ko'paytuvchisini determinant belgisidan tashqariga chiqarish mumkin.

$$\begin{vmatrix} 2a_{11} & 2a_{12} & 2a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = 2\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$$

e) Agar determinantning ikkita parallel qatorlarini o'rimlarini almashtirilsa, determinantning ishorasini qarama-qarshisiga o'zgartiradi;

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} - \begin{vmatrix} a_{21} & a_{22} & a_{23} \\ a_{11} & a_{12} & a_{13} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$$

J) Determinantning qiymati biror qator elementlari bilan shu elementlarga tegishli algebraik to'ldiruvchilari ko'paytmalari yig'indisiga teng.

Bu xossa detrminantni qator elementlari bo'yicha yoyish deyiladi. Undan determinantlarni hisoblashda foydalaniladi.

i)Agar determinant biror qatorining har bir elmenti ikki qo'shiluvchininng yig'indisidan iborat bo'lsa, ularning biri tegishli qator birinchi qo'shiluvchilardan ikkinchisi esa ikkinchi qo'shiluvchilardan iborat bo'ladi

- Masalan;

$$\begin{vmatrix} a_{11} & a_{12}+b_1 & a_{13} \\ a_{21} & a_{22}+b_2 & a_{23} \\ a_{31} & a_{32}+b_3 & a_{33} \end{vmatrix} = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} + \begin{vmatrix} a_{11} & b_1 & a_{13} \\ a_{21} & b_2 & a_{23} \\ a_{31} & b_3 & a_{33} \end{vmatrix}$$

K) Agar determinantning biror qatori elementlariga parallel qatorning mos elementlarini biror o'zgarmas songa ko'paytirib qo'shilsa, determinantning qiymati o'zgarmayd

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31}+\lambda a_{11} & a_{32}+\lambda a_{12} & a_{33}+\lambda a_{13} \end{vmatrix}$$

Yuqori tartibli determinantni hisoblashning ikki ta usulini keltiramiz:

1. Determinant tartibini pasaytirish usuli- determinant biror qatori elementlari bittasidan boshqalarini oldindan nolga aylantirib olib, shu qator bo'yicha yoyish usuli:

$$\Delta = \begin{vmatrix} 3 & -1 & 12 & 8 \\ -5 & 3 & -34 & -23 \\ 1 & 1 & 3 & -7 \\ -9 & 2 & 8 & -15 \end{vmatrix} = \begin{vmatrix} 3 & -1 & 12 & 8 \\ 4 & 0 & 2 & 1 \\ 4 & 0 & 15 & 1 \\ -3 & 0 & 32 & 1 \end{vmatrix} =$$

$$= -(-1)^3 \begin{vmatrix} 4 & 2 & 1 \\ 4 & 15 & 1 \\ -3 & 32 & 1 \end{vmatrix} = \begin{vmatrix} 4 & 2 & 1 \\ 0 & 13 & 0 \\ -7 & 30 & 0 \end{vmatrix} = \begin{vmatrix} 0 & 13 \\ -7 & 30 \end{vmatrix}$$

$$= 91$$

2) Determinantni uchburchak ko'rinishiga keltirish usuli determinantni shunday almashtirishdan iboratki, uning bosh diaganalidan bir tomonida yotuvchi hamma elementlari nolga aylantiriladi va uchburchaksimon shaklga keltiriladi, masalan

$$\Delta = \begin{vmatrix} a_{11} & a_{12} & \ldots & a_{1n} \\ 0 & a_{22} & \ldots & a_{2n} \\ \ldots & \ldots & \ldots & \ldots \\ 0 & 0 & \ldots & a_{nn} \end{vmatrix}$$

- Foydalanilgan adabiyot.

  Y.U.Soatov.

  Bajardi:U.CH.Ahmedv.

  Tekshirdi:A.A.Alimov.

TAMOM

Reja:

- Ikkinchi va uchinchi tartibli determinentlar.
- Determinantlarni hisoblash.
- Determinantlarning asosiy xossalari.
- Yuqori tartibli determinantlar.

- Ikkinchi tartibli kvadrat matritsaga mos keluvchi ikkinchi tartibli determinant deb quyidagi belgi va tenglik bilan aniqlanuvchi songa aytiladi:

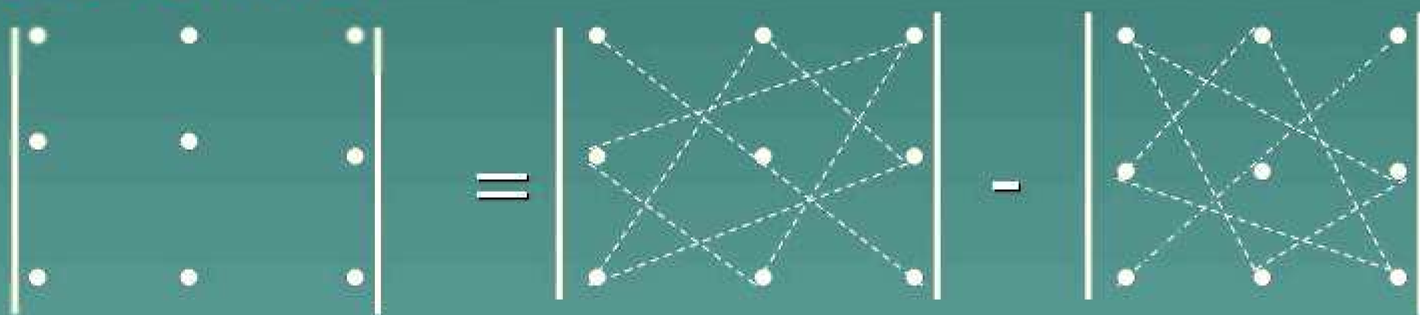
$$\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11}a_{22} - a_{21}a_{12}$$

- Songa o'xshash ushbu ifoda uchinchi tartibli determinant deyiladi:
- $$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$$

Bu ifodaga musbat ishora bilan kiradigan xar bir ko'paytma, xamda manfiy ishorali ko'paytmalar ko'paytuvchilarini aloxida-aloxi

- punktir chiziqlar yordamida tutashtirib, uchinchi tartibli determinant larni xisoblash

uchun xotirada oson saqlanadigan << uchburchaklar qoidasi>> ga ega bo'lamiz.



Bundan tashqari determinantlarni minor usulidan foydalanib va quidagi usul

- bilan yechishimiz mumkin.

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = a_{11} \begin{vmatrix} a_{22} & a_{23} \\ a_{31} & a_{32} \end{vmatrix} - a_{12} \begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix}$$

$$a_{13} \begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix} = a_{11}a_{22}a_{32} - a_{11}a_{23}a_{32} - a_{12}$$

- $a_{21}a_{33} + a_{12}a_{23}a_{31} + a_{13}a_{21}a_{32} -$
  $a_{13}a_{31}a_{22}.$

3 – usul.

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = \begin{vmatrix} a_{11} & a_{12} & a_{13} & a_{11} & a_{12} \\ a_{21} & a_{22} & a_{23} & a_{21} & a \\ a_{31} & a_{32} & a_{33} & a_{31} & a_{32} \end{vmatrix} =$$

$= a_{11}a_{22}a_{33} + a_{12}a_{23}a_{31} + a_{13}a_{21}a_{32} -$
$a_{31}a_{22}a_{13} - a_{32}a_{23}a_{11} - a_{33}a_{21}a_{12}.$

- Determinant a_{ik} elementining M_{ik} minori deb shu determinantdan bu element turgan qator va ustunni o’chirish natijasida xosil bo’lgan determinantga aytiladi.
- Determinant a_{ik} elementining algebraik to’ldiruvchisi.
- $A_{ik} = (-1)^{i+k} M_{ik}$ munosabot bilan aniqlanadi.

- Determinantlarning asosiy xossalari.

a) Agar determinantng barcha satrlari mos ustunlari bilan almashtirilsa, uning qiymati o'zgarmaydi:

$$\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = \begin{vmatrix} a_{13} & a_{23} & a_{33} \\ a_{12} & a_{22} & a_{32} \\ a_{11} & a_{21} & a_{31} \end{vmatrix}$$

b) Agar determinant o lardan iborat qatorga ega bo'lsa uning qiymti o ga teng bo'ladi.