



TESKARI MATRITSANI EXCEL DASTURI YORDAMIDA HISOBLASH

Ochilova Muxlisa Ravshan qizi

Termiz davlat universiteti

Amaliy matematika yo'nalishi 2-kurs talabasi

ochilovamuxlisa47@gmail.com

Jumayeva Mavjuda Baxtiyor qizi

Amaliy matematika yo'nalishi 2-kurs talabasi

Annotatsiya: Mazkur maqola Excel dasturi imkoniyatlaridan foydalangan holda murakkab matrisali amallarni soddalashtirishga bag'ishlanadi. Unda teskari matrisani aniqlashning an'anaviy usullaridan farqli o'laroq, tayyor funksiyalar yordamida vaqtni tejash va xatoliklarni kamaytirish yo'llari ko'rsatib o'tilgan. Maqolada amaliy misollar orqali matrisalarni kiritish, funksiyani qo'llash va natijani massiv ko'rinishida chiqarish jarayoni batafsil tasvirlangan. Ushbu qo'llanma hisob-kitob ishlarini avtomatlashtirishni xohlovchi keng doiradagi foydalanuvchilar uchun foydalidir.

Kalit so'zlar: matritsa, teskari matritsa, determinant, Excel, MINVERSE, MDETERM, MMULT, xos bo'lmagan matritsa.

Teskari matritsani topishning barcha foydalanadigan matematik ta'rif va teoremlarni keltirib o'tamiz va hisoblashlarni ko'rib chiqamiz.

Xos bo'lmagan, ya'ni $\det A$ determinant nol bo'lmagan, A matrisaning teskari matrisasi

$$A^{-1} = \frac{A_{ji}}{\det A}$$

formula yordamida hisoblanadi.

Misol. $A = \begin{pmatrix} 3 & -4 & 5 \\ 2 & -3 & 1 \\ 3 & -5 & -1 \end{pmatrix}$ matrisaga A^{-1} – teskari matritsa topilsin.

Yechish: Bu matritsa determinantini hisoblaymiz

$$\det A = 3 * (-3) * (-1) + (-4) * 1 * 3 + 5 * 2 * (-5) - 5 * (-3) * 3 - 3 * 1 * (-5) - (-4) * 2 * (-1) = 9 - 12 - 50 + 45 + 15 - 8 = -1$$

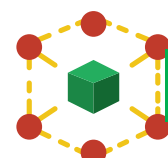
$\det A = -1$ bo'lgani uchun teskari matritsa A^{-1} mavjud. Matritsa elementlarining algebraik to'ldiruvchilarini A_{ji} topamiz:

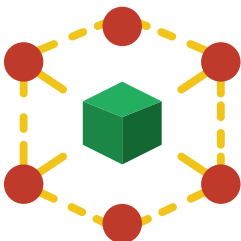
$$A_{11}=8 \quad A_{21}=-29 \quad A_{31}=11$$

$$A_{12}=5 \quad A_{22}=-18 \quad A_{32}=7$$

$$A_{13}=-1 \quad A_{23}=3 \quad A_{33}=-1$$

Ya'ni





$$A_{ji} = \begin{bmatrix} 8 & -29 & 11 \\ 5 & -18 & 7 \\ -1 & 3 & -1 \end{bmatrix}$$

Shunga teng bo'ladi.

Demak teskari matritsa quydagi ko'rinishda bo'ladi

$$A^{-1} = \frac{A_{ji}}{\det A} = \frac{\begin{bmatrix} 8 & -29 & 11 \\ 5 & -18 & 7 \\ -1 & 3 & -1 \end{bmatrix}}{-1} = \begin{bmatrix} -8 & 29 & -11 \\ -5 & 18 & -7 \\ 1 & -3 & 1 \end{bmatrix}$$

Bu matrisani hisoblash ko'p vaqt talab etadi, lekin siz bu usul asosiylikini bilishingiz kerak, elektron jadvalda hisoblashdan oldin. Endi misol yordamida har bir etapni aniqlaylik. Sodda uchun 3x3 o'lchovli holni qaraylik.

Ta'rif. A kvadrat matritsaga teskari matritsa deb, shunday A^{-1} matritsaga aytiladiki, uning uchun quyidagi $A \times A^{-1} = A^{-1} \times A = E$ tenglik o'rinli bo'lsin.

Ta'rif. Agar A matritsa uchun $\det A \neq 0$ bo'lsa, bunday matritsa xos bo'lmagan matritsa, aks holda, ya'ni $\det A = 0$ bo'lsa xos matritsa deyiladi.

Teorema. A kvadrat matritsaga teskari A^{-1} matritsa mavjud va yagona bo'lishi uchun, uning xos bo'lmagan matritsa bo'lishi zarur va yetarlidir. A -matritsa xos bo'lmagan matritsa bo'lsin, ya'ni $\det A \neq 0$ bo'lsin. U holda

$$A^{-1} = \frac{1}{\det A} \begin{pmatrix} A_{11} & A_{21} & \dots & A_{j1} & \dots & A_{n1} \\ A_{12} & A_{22} & \dots & A_{j2} & \dots & A_{n2} \\ A_{1k} & A_{2k} & \dots & A_{jk} & \dots & A_{nk} \\ A_{1n} & A_{2n} & \dots & A_{jn} & \dots & A_{nn} \end{pmatrix}$$

Misol. $A = \begin{pmatrix} 2 & -3 & -2 \\ -4 & -2 & 5 \\ 5 & 1 & -6 \end{pmatrix}$ matritsaga teskari matrisani toping.

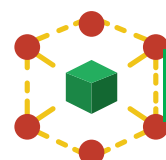
$$\text{Yechish. } \det A = \begin{vmatrix} 2 & -3 & -2 \\ -4 & -2 & 5 \\ 5 & 1 & -6 \end{vmatrix} = 24 + 8 - 75 - 20 - 10 + 72 = -1$$

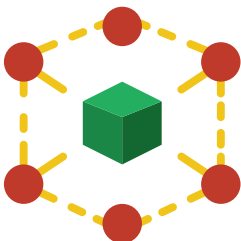
$$A_{11}=7 \quad A_{21}=-20 \quad A_{31}=-19$$

$$A_{12}=1 \quad A_{22}=-2 \quad A_{32}=-2$$

$$A_{13}=6 \quad A_{23}=-17 \quad A_{33}=-16$$

$$A^{-1} = \frac{1}{\det A} \begin{pmatrix} 7 & -20 & -19 \\ 1 & -2 & -2 \\ 6 & -17 & -16 \end{pmatrix} = \frac{1}{-1} \begin{pmatrix} 7 & -20 & -19 \\ 1 & -2 & -2 \\ 6 & -17 & -16 \end{pmatrix} = \begin{pmatrix} -7 & 20 & 19 \\ -1 & 2 & 2 \\ -6 & 17 & 16 \end{pmatrix}$$





Excel dasturida hisoblash teskari matritsa hisoblash

Teskari matrisani Excel dasturida qulay hisoblash mumkin. Qisqa vaqtda $n \times n$ matritsaga teskari matrisa topishni o'rganamiz. Quyidagi misolda 4×4 matritsaga teskari matrisa topishni Excel dasturi yordamida qanday tez va oson topish tushuntiriladi. Shundan so'ng siz bu kabi misollarni Excel dasturi yordamida tez bajarishni bilib olaviz.

Misol. $A = \begin{pmatrix} 10 & 6 & 8 & 3 \\ 1 & 1 & 3 & -4 \\ 4 & -2 & -1 & 11 \\ 9 & 7 & 6 & -13 \end{pmatrix}$ matritsaga teskari matrisani toping.

1-jadvalda ko'rsatilgani kabi A matrisa elementlarini Excel electron doskasiga kiriting. Bu jadvalda A matrisa elementlarini (A1:D4) yacheykalariga joylashtiriladi. Quydagicha:

	A	B	C	D
1	10	6	8	3
2	1	1	3	-4
3	4	-2	-1	11
4	9	7	6	-13

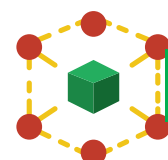
(A7) yacheykaga 1×1 o'lchovli blok ajrating va keyin = MDETERM (A1:D4) formulasini Ctrl+Shift+ENTER klavishlarini bir vaqtda bosgan holda kiriting.

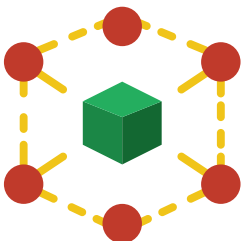
Bu orqali matritsaning detA si topasiz. Ya'ni:

	A	B	C	D
1	10	6	8	3
2	1	1	3	-4
3	4	-2	-1	11
4	9	7	6	-13
5				
6	detA			
7	-1380			

Endi Matritsaga teskari matritsa A^{-1} topish uchun

(A9:D12) yacheykalarida 4×4 o'lchovli blok ajrating va =MINVERSE(A1:D4) formulasini Ctrl+Shift+ENTER klavishlarini bir vaqtda bosgan holda kiriting va quyidagi natija hosil bo'ladi.





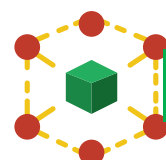
	A	B	C	D
1	10	6	8	3
2	1	1	3	-4
3	4	-2	-1	11
4	9	7	6	-13
5				
6	detA			
7	-1380			
8	Aji			
9	-0,08696	0,05435	0,18478	0,11957
10	0,1942	-0,56304	-0,28768	-0,02536
11	0,06087	0,38696	-0,00435	-0,1087
12	0,07246	-0,08696	-0,02899	-0,05797

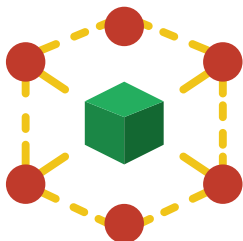
Endi javob to'g'riligini tekshirish uchun (A1:D4;A9:D12) yacheykalarida 4×4 o'lchovli blok ajrating va =ROUND(MMULT(A1:D4; A9:D12); 0) formulasini Ctrl+Shift+ENTER klavishlarini bir vaqtda bosgan holda kiriting va quydagi natija hosil bo'ladi.

	A	B	C	D
1	10	6	8	3
2	1	1	3	-4
3	4	-2	-1	11
4	9	7	6	-13
5				
6	detA			
7	-1380			
8	Aji			
9	-0,08696	0,05435	0,18478	0,11957
10	0,1942	-0,56304	-0,28768	-0,02536
11	0,06087	0,38696	-0,00435	-0,1087
12	0,07246	-0,08696	-0,02899	-0,05797
13				
14	1	0	0	0
15	0	1	0	0
16	0	0	1	0
17	0	0	0	1

FOYDALANILGAN ADABIYOTLAR

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