BA'ZI GEOMETRIK MASALALARNI DETERMINANTLAR YORDAMIDA YECHISH

Olimboyev To'lqin G'ayrat o'g'li
Urganch davlat universiteti o'qituvchisi
Iskandarov Sarvar Baltabayevich
Urganch davlat universiteti o'qituvchisi
Yaxshimuratova Dilfuza Atamuratovna
Xiva tuman 40-son maktab o'qituvchisi

ANNOTATSIYA

Maqolada ba'zi geometrik masalalarni determinantlar orqali soddaroq yechish usullari keltirilgan. Masalalarni determinantlar orqali soda yechish jarayonida o'quvchini mantiqiy fikrlash salohiyatini keng tahlil qilishiga olib keladi.

Kalit so'zlar: *determinant, vektor, formula,uchburchak, koordinata, tekislik, yuza.*

ABSTRACT

The article presents simpler ways to solve some geometric problems using determinants. In the process of solving problems using determinants, soda leads to a broad analysis of the student's ability to think logically.

Keywords: *determinant, vector, formula, triangle, coordinate, plane, surface.*

KIRISH

Bu maqolada biz ba'zi geometrik masalalarni yechishda determinantlar orqali soddaroq usullarda yechishni ko'rsatamiz. Eng avvalo biz 2-va 3-tartibli determinantlar haqida ma'lumotlarga ega bo'lishimiz kerak.

2-tartibli determinant quyidagicha hisoblanadi:

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

Masalan, $\begin{vmatrix} 4 & 8 \\ 5 & 7 \end{vmatrix} = 4 \cdot 7 - 8 \cdot 5 = 28 - 40 = -12$.

3-tartibli determinant quyidagicha hisoblanadi:

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

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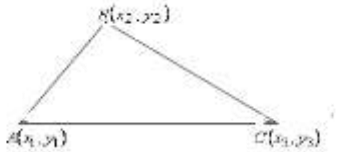
Masalan, $\begin{vmatrix} 2 & -1 & 0 \\ 1 & 3 & -2 \\ -3 & 0 & 4 \end{vmatrix} = 24-6-0-0+4-0=22$

Endi ba'zi geometrik o'lchovlarning determinant orqali hosil bo'lgan formulalarini keltirib o'tamiz.

Uchlari $A(x_1; y_1)$, $B(x_2; y_2)$, $C(x_3; y_3)$ nuqtada bo'lgan uchburchak yuzi quyidagi



formula orqali topiladi:

$$S = \frac{1}{2} \cdot \left\| \begin{matrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{matrix} \right\| \qquad (1)$$

Uchlari $A(x_1; y_1; z_1)$, $B(x_2; y_2; z_2)$, $C(x_3; y_3; z_3)$, $D(x_4; y_4; z_4)$ nuqtalarda bo`lgan tetraedrning hajmini quyidagi formula orqali topiladi:

$$V_{tetraedr} = \frac{1}{6} \cdot \left\| \begin{matrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ x_3 - x_1 & y_3 - y_1 & z_3 - z_1 \\ x_4 - x_1 & y_4 - y_1 & z_4 - z_1 \end{matrix} \right\|. \qquad (2)$$

Bu ma'lumotlar orqali biz bir nechta masalalarni yechimini keltiramiz .

MUHOKAMA

1-masala. Barcha uchlari ratsional nuqtalarda bo`lgan muntazam uchburchak yo'q ekanligini isbotlang.

Isbot. Bunday ABC uchburchak mavjud va uning uchlari $A(x_1; y_1)$, $B(x_2; y_2)$, $C(x_3; y_3)$ nuqtalarda joylashgan deb hisoblaymiz. U xolda ushbu

$\bar{a} = \overline{CA} = (x_1 - x_3, y_1 - y_3) = (a_1, a_2)$, $\bar{b} = \overline{CB} = (x_2 - x_3, y_2 - y_3) = (b_1, b_2)$

vektorlarning koordinatalari ratsional sonlar bo`ladi, bu vektorlar orasidagi burchak 60^o. Birinchi tomondan

$$S = \frac{1}{2} | a_1 b_2 - b_1 a_2 |$$

bo`lgani uchun $ABC$ uchburchakning yuzasi ratsional son bo`ladi. Ikkinchi tomondan

$$S=\frac{|CA|^2\sqrt{3}}{4}=\frac{(a_1^2+a_2^2)\sqrt{3}}{4}$$

bo`lgani uchun *ABC* uchburchakning yuzasi irratsional son bo`ladi. Ziddiyat, demak, farazimiz no'to`g`ri ekan.

NATIJA

Demak, bunday uchburchak yo'q ekan.Keltirilgan fikr isbotlandi.

2-masala. Uchlari A(2;1), B(-3;4), C(4;3) nuqtalarda bo'lgan uchburchak yuzini hisoblang.

Yechish. (1) formulaga ko'ra,

$x_1=2, x_2=-3, x_3=4$ *va* $y_1=1, y_2=4, y_3=3$ deb olsak, u holda uchburchak yuzi quyidagicha bo'ladi:

$$S=\frac{1}{2}\cdot\left\|\begin{matrix}2&1&1\\-3&4&1\\4&3&1\end{matrix}\right\|=8\ (kv.birlik)$$

XULOSA

1. $y^2=2px$ parabolaning uchta A,B,C nuqtalaridan o'tkazilgan urunmalar KLM uchburchakini hosil etadi. U holda $2S_{KLM}=S_{ABC}$ tengligini isbotlang.
2. Agarda $A(x_1;y_1)$, $B(x_2;y_2)$, $C(x_3;y_3)$ nuqtalar bir to'g'ri chiziqda yotsa, quyidagi tenglikni isbotlang:

$$\begin{vmatrix}1&1&1\\x_1&x_2&x_3\\y_1&y_2&y_3\end{vmatrix}=0$$

3. Barcha uchlari ratsional nuqtalarda bo`lgan muntazam *n* burchak yoq ekanligini isbotlang. Bu yerda $n\geq3,\ n\neq4$.
4. To'gri burchakli parallelepipedning barcha qirralari yig'indisi L ga teng bo'lsa, Uning to'la sirtining eng katta qiymatini toping.

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