

Nazariy savollar

Kompleks sonlar va ularning trigonometrik shakli. Muavr formulasi. Kompleks sonlar va ular ustida amallar. Kompleks sonning geometrik tasviri va trigonometrik shakli. Muavr formulasi. Kompleks sonni darajaga oshirish. Kompleks sondan ildiz chiqarish. Birning ildizlari.
Matritsalar va ular ustida amallar. O‘rin almashtirishlar. Matritsalar va ular ustida amallar. Chiziqli tenglamalar sistemasini yechishning Gauss usuli. O‘rin almashtirishlar va o‘rniga qo‘yishlar.
n-tartibli determinantlar va ularning xossalari. Kichik tartibli determinantlar. n-tartibli determinantlar va ularning xossalari. Determinantlarni hisoblash usullari.
Algebraik to‘ldiruvchi va minorlar. Kramer formulalari. Taskari matritsa. Algebraik to‘ldiruvchi va minorlar. Determinantning qo‘shimcha xossalari. Chiziqli tenglamalar sistemasini yechishning Kramer usuli. Teskari matritsa. Chiziqli tenglamalar sistemasini yechishning matritsaviy usuli.
Chiziqli fazo. O‘lcham va bazis. Chiziqli (vektor) fazolar. n-o‘lchamli shiziqli fazoning o‘lchami va bazisi.
Chiziqli bog‘liq va chiziqli erkli vektorlar haqida teoremlar. Matritsaning rangi. Chiziqli bog‘liq va chiziqli erkli vektorlar. Matritsaning rangi haqida teoremlar.
Chiziqli tenglamalar sistemasini to‘la yechish. Bir jinsli tenglamalar sistemasining fundamental yechimlari. Kroneker-Kapelli teoremasi. Chiziqli tenglamalar sistemasining umumiy va xususiy yechimi. Bir jinsli tenglamalar sistemasining fundamental yechimlari.
Chiziqli qism fazo. Qism fazolarning yig‘indisi va kesishmasi. Chiziqli fazoning qism fazosi. Qism fazolarning yig‘indisi va kesishmasi haqidagi teoremlar.
Yevklid fazosi. Ortogonal va ortonormal sistemalar. Skalyar ko‘paytma Yevklid fazosi ta’rifi. Koshi-Bunyakovskiy tengsizligi. Ortogonal va ortonormal bazis.
Ortogonalashtirish jarayoni. Qism fazoning ortogonal to‘ldiruvchisi. Ortogonalashtirish jarayoni. Qism fazoning ortogonal proeksiyasi va ortogonal to‘ldiruvchisi.
Kvadratik forma va uning kanonik shakli. Bichiziqli va kvadratik formalar. Kvadratik formani kanonik ko‘rinishga keltirish usullari. Musbat aniqlangan kvadratik formalar. Inersiya qonuni.
Chiziqli almashtirishlar va ularning matritsasi. Chiziqli almashtirishlarning obrazi, yadrosi. Turli bazislarda chiziqli almashtirish matritsalar orasidagi bog‘lanish. Chiziqli almashtirishlar va ularning matritsasi. Chiziqli almashtirishlarning obrazi, yadrosi. Turli bazislarda chiziqli almashtirish matritsalar orasidagi bog‘lanish.
Invariant qism fazolar. Chiziqli almashtirishning xos son va xos vektorlari. Invariant qism fazolar. Chiziqli almashtirishning xos son va xos vektorlari.
Yevklid fazosida chiziqli almashtirishlarga qo‘shma almashtirish. Qo‘shma almashtirishlar. Yevklid fazosida chiziqli almashtirishlarga qo‘shma almashtirish.
O‘z-o‘ziga qo‘shma, unitar va normal almashtirishlar. O‘z-o‘ziga qo‘shma, unitar va normal almashtirishlar.

Amaliy topshiriqlar

- z_1 va z_2 sonlarning ko‘paytmasini va nisbatini toping: $z_1 = 2 + i\sqrt{3}$, $z_2 = 3 + i\sqrt{2}$
- z_1 va z_2 sonlarning ko‘paytmasini va nisbatini toping: $z_1 = 7 + 3i$, $z_2 = 3 - 7i$
- z_1 va z_2 sonlarning ko‘paytmasini va nisbatini toping: $z_1 = 3 + 4i$, $z_2 = 3 - 4i$
- z_1 va z_2 sonlarning ko‘paytmasini va nisbatini toping: $z_1 = \sqrt{2} - \sqrt{5}i$, $z_2 = \sqrt{8} + \sqrt{5}i$
- z_1 va z_2 sonlarning ko‘paytmasini va nisbatini toping: $z_1 = 2 + \sqrt{5}i$, $z_2 = 2 - \sqrt{5}i$
- z_1 va z_2 sonlarning ko‘paytmasini va nisbatini toping: $z_1 = \sqrt{3} + \sqrt{7}i$, $z_2 = \sqrt{3} + \sqrt{7}i$

7. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = 2 - \sqrt{5}i$, $z_2 = \sqrt{5} + 2i$
8. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = 2 + \sqrt{2}i$, $z_2 = \sqrt{2} - 2i$
9. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = \sqrt{3} + i\sqrt{5}$, $z_2 = \sqrt{5} + i\sqrt{3}$
10. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = 8 + 3i$, $z_2 = 3 - 2i$
11. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = \sqrt{2} + i$, $z_2 = \sqrt{2} - i$
12. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = 3 + 4i$, $z_2 = 4 - 3i$
13. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = 2 + 3i$, $z_2 = 2 - 3i$
14. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = \sqrt{5} - \sqrt{3}i$, $z_2 = \sqrt{2} + \sqrt{3}i$
15. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = 1 + \sqrt{2}i$, $z_2 = 1 - \sqrt{2}i$
16. z_1 va z_2 sonlarning ko'paytmasini va nisbatini toping: $z_1 = \sqrt{5} + \sqrt{3}i$, $z_2 = \sqrt{5} + \sqrt{3}i$
17. Hisoblang: $(\sqrt{3} + i\sqrt{3})^6 \cdot (1 + i)^3$
18. Hisoblang: $(-\sqrt{3} - 3i)^3 \cdot (1 + i)^3$
19. Hisoblang: $(-\sqrt{2} + i\sqrt{2})^6 \cdot (3 + \sqrt{3}i)^3$
20. Hisoblang: $(2 - 2i)^3 \cdot (1 - i)^2$
21. Hisoblang: $(\sqrt{3} - i\sqrt{3})^4 \cdot (1 - i)^4$
22. Hisoblang: $(-1 - i\sqrt{3})^5 \cdot (-1 - i)^2$
23. Hisoblang: $(-1 + i)^7 \cdot (1 - \sqrt{3})^5$
24. Hisoblang: $(-\sqrt{3} + 3i)^6 \cdot (3 + \sqrt{3}i)^4$
25. Hisoblang: $(\frac{\sqrt{3}}{3} + i)^4 \cdot (1 - i)^5$
26. Hisoblang: $(\sqrt{3} - i)^6 \cdot (1 - \sqrt{3}i)^3$
27. Hisoblang: $\sqrt[3]{1 + i}$
28. Hisoblang: $\sqrt[6]{-1 - i}$
29. Hisoblang: $\sqrt[9]{3 - \sqrt{3}i}$
30. Hisoblang: $\sqrt[3]{1 - i}$
31. Hisoblang: $\sqrt[6]{-\frac{1}{4} - \frac{\sqrt{3}}{4}i}$
32. Hisoblang: $\sqrt[5]{-1}$

Determinantni hisoblang

1. a) $\begin{vmatrix} 3 & 5 \\ 5 & 7 \end{vmatrix}$ b) $\begin{vmatrix} 2 & 9 \\ -1 & 5 \end{vmatrix}$
2. a) $\begin{vmatrix} 2 & 1 \\ 0 & 4 \end{vmatrix}$ b) $\begin{vmatrix} 4 & 3 \\ 5 & 7 \end{vmatrix}$
3. a) $\begin{vmatrix} 1 & 2 & 3 \\ 3 & 5 & 4 \\ 2 & 1 & 2 \end{vmatrix}$ b) $\begin{vmatrix} 1 & -2 & 4 \\ 5 & 1 & 7 \\ 3 & 5 & -1 \end{vmatrix}$
4. a) $\begin{vmatrix} 6 & 1 & -2 \\ 0 & 3 & -1 \\ -1 & 4 & 5 \end{vmatrix}$ b) $\begin{vmatrix} 1 & -2 & 4 \\ 5 & 1 & 7 \\ 3 & 5 & -1 \end{vmatrix}$
5. a) $\begin{vmatrix} 0 & a & 0 \\ a & 1 & a \\ 0 & a & 0 \end{vmatrix}$ b) $\begin{vmatrix} b & a & b \\ a & 1 & a \\ b & a & b \end{vmatrix}$
6. a) $\begin{vmatrix} 1 & 81 & 2 \\ -1 & 9 & 1 \\ 3 & -7 & 4 \end{vmatrix}$ b) $\begin{vmatrix} 1 & -80 & 2 \\ -1 & -9 & 1 \\ 3 & 7 & 4 \end{vmatrix}$

$$7. a) \begin{vmatrix} -3 & 1 & -74 \\ 4 & 0 & 9 \\ -1 & 1,5 & -8 \end{vmatrix} + \begin{vmatrix} -3 & 2 & 75 \\ 4 & 0 & -9 \\ -1 & 3 & 8 \end{vmatrix} \quad b) \begin{vmatrix} 1 & -3 & 4 \\ 2 & 5 & -1 \\ 101 & -99 & -7 \end{vmatrix} + \begin{vmatrix} 1 & -3 & 4 \\ -2 & -5 & 1 \\ -101 & 98 & 7 \end{vmatrix}$$

$$8. a) \begin{vmatrix} 3 & 4 & 1 \\ 3 & -1 & 0 \\ -1 & 14 & -13 \end{vmatrix} \quad b) \begin{vmatrix} 1 & 3 & 2 \\ -2 & -1 & 4 \\ -5 & 1 & 3 \end{vmatrix} \quad 9. a) 3 \cdot \begin{vmatrix} 3 & 4 & 1 \\ -1 & 2 & 0 \\ 2 & -14 & 13 \end{vmatrix} \quad b) 2 \cdot \begin{vmatrix} 3 & 5 & 7 \\ 1 & 0 & 4 \\ 2 & 1 & 4 \end{vmatrix}$$

$$10. a) \begin{vmatrix} 5 & 0 & 15 \\ 20 & 7 & 32 \\ 43 & 4 & 3 \end{vmatrix} \quad b) \begin{vmatrix} 7 & 2 & 8 \\ 1 & 4 & 15 \\ 20 & 2 & 9 \end{vmatrix} \quad 11. a) \begin{vmatrix} \frac{1-t^2}{1+t^2} & \frac{2t}{1+t^2} \\ -2t & \frac{1-t^2}{1+t^2} \end{vmatrix} \quad b) \begin{vmatrix} \frac{(1-t)^2}{1+t^2} & \frac{2t}{1+t^2} \\ \frac{2t}{1+t^2} & -\frac{(1-t)^2}{1+t^2} \end{vmatrix}$$

$$12. a) \begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix} \quad b) \begin{vmatrix} 0 & a & 0 \\ b & c & d \\ 0 & e & 0 \end{vmatrix} \quad 13) a) \begin{vmatrix} a & x & x \\ x & b & x \\ x & x & c \end{vmatrix} \quad b) \begin{vmatrix} a+x & x & x \\ x & b+x & x \\ x & x & c+x \end{vmatrix}$$

$$14. a) \begin{vmatrix} \alpha^2+1 & \alpha\beta & \alpha\gamma \\ \alpha\beta & \beta^2+1 & \beta\gamma \\ \alpha\gamma & \beta\gamma & \gamma^2+1 \end{vmatrix} \quad b) \begin{vmatrix} \cos\alpha & \sin\alpha \cos\beta & \sin\alpha \sin\beta \\ -\sin\alpha & \cos\alpha \cos\beta & \cos\alpha \sin\beta \\ 0 & -\sin\beta & \cos\beta \end{vmatrix}$$

$$15. a) \begin{vmatrix} \sin\alpha & \cos\alpha & 1 \\ \sin\beta & \cos\beta & 1 \\ \sin\gamma & \cos\gamma & 1 \end{vmatrix} \quad b) \begin{vmatrix} 1+\cos\alpha & 1+\sin\alpha & 1 \\ 1-\sin\alpha & 1+\cos\alpha & 1 \\ 1 & 1 & 1 \end{vmatrix}$$

$$16. a) \begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & 1 \\ 1 & 1 & -1 & 1 \\ 1 & 1 & 1 & -1 \end{vmatrix} \quad b) \begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{vmatrix} \quad 17. a) \begin{vmatrix} 2 & -5 & 1 & 2 \\ -3 & 7 & -1 & 4 \\ 5 & -9 & 2 & 7 \\ 4 & -6 & 1 & 2 \end{vmatrix} \quad b) \begin{vmatrix} -3 & 9 & 3 & 6 \\ -5 & 8 & 2 & 7 \\ 4 & -5 & -3 & -2 \\ 7 & -8 & -4 & -5 \end{vmatrix}$$

$$18. a) \begin{vmatrix} 3 & -3 & -5 & 8 \\ -3 & 2 & 4 & -6 \\ 2 & -5 & -7 & 5 \\ -4 & 3 & 5 & -6 \end{vmatrix} \quad b) \begin{vmatrix} 2 & -5 & 4 & 3 \\ 3 & -4 & 7 & 5 \\ 4 & -9 & 8 & 5 \\ -3 & 2 & -5 & 3 \end{vmatrix} \quad 19. a) \begin{vmatrix} 3 & -3 & -2 & -5 \\ 2 & 5 & 4 & 6 \\ 5 & 5 & 8 & 7 \\ 4 & 4 & 5 & 6 \end{vmatrix} \quad b) \begin{vmatrix} 1 & -2 & -5 & -3 \\ 2 & 7 & 0 & 4 \\ 4 & 1 & 3 & 6 \\ 1 & 2 & 2 & 0 \end{vmatrix}$$

$$20. a) \begin{vmatrix} 4 & -2 & -3 & 5 \\ -1 & 1 & 5 & -4 \\ 5 & -4 & -1 & 3 \\ -2 & 0 & 3 & -2 \end{vmatrix} \quad b) \begin{vmatrix} 5 & -7 & 1 & 0 \\ 2 & -5 & 0 & 1 \\ 3 & -3 & 2 & 7 \\ -2 & 1 & -4 & 6 \end{vmatrix}$$

Matritsalar va ular ustida amallar

$$1. A = \begin{pmatrix} 1 & 3 \\ 5 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 5 \\ 6 & -1 \end{pmatrix}, \quad A+B, 2A, 2A-3B, A \cdot B, B \cdot A \text{ ni hisoblang.}$$

2. $A = \begin{pmatrix} 0 & 3 \\ 2 & -5 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 2 \\ -6 & -3 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$ ni hisoblang.

3. $A = \begin{pmatrix} 1 & 3 & 5 \\ 4 & 2 & -1 \\ 3 & 2 & 6 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 1 & 2 \\ 7 & -5 & 1 \\ 3 & 4 & 3 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$ ni hisoblang.

4. $A = \begin{pmatrix} 2 & 4 & 5 \\ 1 & 3 & -2 \\ 2 & 7 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 7 & 3 \\ 3 & -1 & 6 \\ 4 & 4 & 2 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$ ni hisoblang.

5. $3 \cdot \begin{pmatrix} 1 & -7 & 3 \\ 2 & 4 & 5 \\ -8 & 7 & 6 \end{pmatrix} - 5 \cdot \begin{pmatrix} 1 & 2 & 3 \\ 4 & 3 & 2 \\ 1 & 5 & 4 \end{pmatrix} + \begin{pmatrix} 1 & -4 & 3 \\ 0 & 2 & 7 \\ -5 & 1 & 9 \end{pmatrix}$ 6. $\begin{pmatrix} 7 & 4 & 1 \\ 3 & 3 & 9 \\ 4 & 2 & 5 \end{pmatrix} - 4 \cdot \begin{pmatrix} 1 & 3 & 3 \\ 2 & 9 & -7 \\ 4 & 1 & 3 \end{pmatrix} + 2 \cdot \begin{pmatrix} 1 & 0 & 5 \\ 2 & -7 & 3 \\ 4 & 6 & 9 \end{pmatrix}$

7. $A = \begin{pmatrix} 1 & 9 & 3 \\ -5 & 0 & 1 \\ -7 & 2 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & -10 & 7 \\ -3 & 9 & 5 \\ -4 & 1 & -3 \end{pmatrix}$, $C = \begin{pmatrix} 1 & 1 & 4 \\ 2 & 0 & 3 \\ 3 & 2 & 3 \end{pmatrix}$, $4A - B + 2C = ?$

8. $A = \begin{pmatrix} 2 & 0 & 5 \\ -1 & 1 & 2 \\ -3 & 4 & -4 \end{pmatrix}$, $B = \begin{pmatrix} 3 & -15 & 0 \\ -6 & 3 & 4 \\ -7 & 4 & -1 \end{pmatrix}$, $C = \begin{pmatrix} 0 & 6 & 3 \\ 3 & 5 & 7 \\ 1 & 1 & 2 \end{pmatrix}$, $2A - 3B + C = ?$

9. $A = \begin{pmatrix} a & 2 \\ 3 & a \end{pmatrix}$, $B = \begin{pmatrix} 2 & a \\ 1 & 5 \end{pmatrix}$, $A \cdot B, B \cdot A = ?$

10. $A = \begin{pmatrix} a & 3 \\ b & a \end{pmatrix}$, $B = \begin{pmatrix} a & 3 \\ b & 7 \end{pmatrix}$, $A \cdot B, B \cdot A = ?$

11. $A = \begin{pmatrix} 7 & 1 & 3 \\ 2 & 0 & 5 \\ 3 & -1 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 3 & -1 & 4 \\ 0 & 3 & -1 \\ 0 & 0 & 3 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$

12. $A = \begin{pmatrix} 3 & 0 & 5 \\ 1 & 1 & 3 \\ 6 & -2 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 & 3 \\ 1 & 0 & -3 \\ 2 & 1 & 4 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$

13. $A = \begin{pmatrix} a & b & c \\ c & b & a \\ 1 & 1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & a & c \\ 1 & b & b \\ 1 & c & a \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$

14. $A = \begin{pmatrix} b & c & a \\ a & c & b \\ 1 & 1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & b & a \\ 1 & c & c \\ 1 & a & b \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$

15. $A = \begin{pmatrix} 10 & 26 \\ 23 & -12 \end{pmatrix}$, $B = \begin{pmatrix} 6 & 20 \\ -4 & -15 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$

16. $A = \begin{pmatrix} 12 & 27 \\ 25 & -15 \end{pmatrix}$, $B = \begin{pmatrix} 9 & 29 \\ -3 & -11 \end{pmatrix}$, $A+B, A \cdot B, B \cdot A$

17. $\begin{pmatrix} 2 & -2 \\ 3 & 7 \end{pmatrix} - 5 \cdot \begin{pmatrix} 2 & 7 \\ 1 & 5 \end{pmatrix} + 3 \cdot \begin{pmatrix} 3 & -5 \\ 2 & 7 \end{pmatrix}$ 18. $\begin{pmatrix} 2 & 6 \\ 1 & 9 \end{pmatrix} - 7 \cdot \begin{pmatrix} 2 & 3 \\ 5 & 1 \end{pmatrix} + 4 \cdot \begin{pmatrix} 3 & 2 \\ 7 & -3 \end{pmatrix}$

$$19. A = \begin{pmatrix} 2 & 4 & 3 \\ 7 & 1 & -2 \\ 5 & 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 5 & 3 \\ 0 & -1 & 2 \\ 4 & 2 & 4 \end{pmatrix}, \quad A+B, A \cdot B, B \cdot A \text{ ni hisoblang.}$$

$$20. A = \begin{pmatrix} 3 & 1 & 0 \\ 2 & 5 & -1 \\ 1 & 4 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 3 & 2 \\ 4 & -5 & 4 \\ 2 & 1 & 3 \end{pmatrix}, \quad A+B, A \cdot B, B \cdot A \text{ ni hisoblang.}$$

Berilgan matritsalar uchun teskari matritsani toping

$$1. A = \begin{pmatrix} -1 & 1 \\ 4 & 2 \end{pmatrix} \quad 2. A = \begin{pmatrix} -1 & 2 \\ 3 & 4 \end{pmatrix} \quad 3. A = \begin{pmatrix} 2 & 3 & 2 \\ 5 & 1 & 4 \\ 1 & -2 & -1 \end{pmatrix} \quad 4. A = \begin{pmatrix} 2 & -1 & 0 \\ 0 & 2 & 1 \\ 1 & 1 & 3 \end{pmatrix}$$

$$5. A = \begin{pmatrix} 1 & 0 & -2 \\ 3 & 1 & 0 \\ -1 & 2 & 4 \end{pmatrix} \quad 6. A = \begin{pmatrix} 3 & -4 & 5 \\ 2 & -3 & 1 \\ 3 & -5 & -1 \end{pmatrix} \quad 7. A = \begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix} \quad 8. A = \begin{pmatrix} 1 & 3 \\ 2 & 6 \end{pmatrix}$$

$$9. A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 3 & 2 \\ 1 & 5 & 4 \end{pmatrix} \quad 10. A = \begin{pmatrix} 1 & 0 & 5 \\ 2 & -7 & 3 \\ 4 & 6 & 9 \end{pmatrix} \quad 11. A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 2 \end{pmatrix} \quad 12. A = \begin{pmatrix} 2 & 5 & 7 \\ 6 & 3 & 4 \\ 5 & -2 & -3 \end{pmatrix}$$

$$13. A = \begin{pmatrix} 1 & 5 & 7 \\ 3 & 1 & 1 \\ 2 & 3 & 4 \end{pmatrix} \quad 14. A = \begin{pmatrix} 2 & -1 & 7 \\ 5 & 3 & 2 \\ 1 & 4 & 3 \end{pmatrix}$$

Tenglamani yeching

$$15. \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} X = \begin{pmatrix} 3 & 5 \\ 5 & 9 \end{pmatrix} \quad 16. \begin{pmatrix} 1 & -3 \\ 4 & -6 \end{pmatrix} X = \begin{pmatrix} 2 & 3 \\ 4 & 6 \end{pmatrix} \quad 17. \begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix} X = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}$$

$$18. X \begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix} \quad 19. \begin{pmatrix} 1 & 2 & -3 \\ 3 & 2 & -4 \\ 2 & -1 & 0 \end{pmatrix} X = \begin{pmatrix} 1 & -3 & 0 \\ 10 & 2 & 7 \\ 10 & 7 & 8 \end{pmatrix} \quad 20. \begin{pmatrix} 1 & 2 & 0 \\ 2 & 5 & -2 \\ 0 & -2 & 5 \end{pmatrix} X = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

Tenglamalar sistemasini Gauss, Kramer, Matritsaviy usulda yeching

$$1. \begin{cases} 3x_1 + 2x_2 + x_3 = 5 \\ 2x_1 + 3x_2 + x_3 = 1 \\ 2x_1 + x_2 + 3x_3 = 11 \end{cases} \quad 2. \begin{cases} x_1 - 2x_2 + 3x_3 = 6 \\ 2x_1 - 3x_2 - 4x_3 = 20 \\ 3x_1 - 2x_2 - 5x_3 = 6 \end{cases} \quad 3. \begin{cases} x_1 - x_2 + x_3 = 6 \\ 2x_1 + x_2 + x_3 = 3 \\ x_1 + x_2 + x_3 = 5 \end{cases}$$

$$4. \begin{cases} 2x_1 + x_2 = 3 \\ 3x_1 + 4x_3 = -1 \\ x_1 - x_2 + 2x_3 = -2 \end{cases} \quad 5. \begin{cases} x_1 + x_2 - x_3 = 2 \\ -2x_1 + x_2 + x_3 = 0 \\ x_1 + x_2 + x_3 = 6 \end{cases} \quad 6. \begin{cases} 2x_1 + 3x_3 = 4 \\ 4x_1 + x_2 = 6 \\ 2x_1 - x_2 - 2x_3 = 0 \end{cases}$$

$$7. \begin{cases} 4x_1 - 3x_2 + 2x_3 = 9 \\ 2x_1 + 5x_2 - 3x_3 = 4 \\ 5x_1 + 6x_2 - 2x_3 = 18 \end{cases}$$

$$8. \begin{cases} x_1 + x_2 - 2x_3 = -4 \\ 3x_1 + x_2 - 5x_3 = -8 \\ x_1 - 4x_2 + x_3 = 7 \end{cases}$$

$$9. \begin{cases} 2x_1 - x_2 + 6x_3 = -1 \\ x_1 + 3x_2 - 4x_3 = 3 \\ 5x_1 + 2x_2 + x_3 = -3 \end{cases}$$

$$10. \begin{cases} x_1 + 2x_2 + 3x_3 = 2 \\ -x_1 + 3x_2 + 4x_3 = -3 \\ 2x_1 + 5x_2 + 2x_3 = -7 \end{cases}$$

$$11. \begin{cases} 2x_1 - x_2 + 4x_3 = 1 \\ 3x_1 + x_2 + 5x_3 = 2 \\ x_1 + 7x_2 - x_3 = 2 \end{cases}$$

$$12. \begin{cases} 3x_1 - x_2 = 5 \\ -2x_1 + x_2 + x_3 = 0 \\ 2x_1 - x_2 + 4x_3 = 15 \end{cases}$$

$$13. \begin{cases} 2x_1 + x_2 + 2x_3 = 6 \\ 3x_1 + 2x_3 = 8 \\ x_1 + x_2 - x_3 = 1 \end{cases}$$

$$14. \begin{cases} x_1 + x_2 + 2x_3 = -1 \\ 2x_1 - x_2 + 2x_3 = -4 \\ 4x_1 + x_2 + 4x_3 = -2 \end{cases}$$

$$15. \begin{cases} 5x_1 + 4x_3 = 1 \\ x_1 - x_2 + 2x_3 = 0 \\ 4x_1 + x_2 + 2x_3 = 1 \end{cases}$$

$$16. \begin{cases} 3x_2 + 2x_3 = 5 \\ 2x_1 + x_2 - x_3 = 4 \\ -x_2 + 2x_3 = 1 \end{cases}$$

$$17. \begin{cases} 2x_1 - x_2 - x_3 = 4 \\ 3x_1 + 4x_2 - 2x_3 = 11 \\ 3x_1 - 2x_2 + 4x_3 = 11 \end{cases}$$

$$18. \begin{cases} 2x_1 + 2x_2 - x_3 = 4 \\ 3x_1 + x_2 - 3x_3 = 7 \\ x_1 + x_2 + 2x_3 = 3 \end{cases}$$

$$19. \begin{cases} x_1 + 2x_3 = 5 \\ 3x_1 - x_2 = 9 \\ x_1 + x_2 - 2x_3 = 1 \end{cases}$$

$$20. \begin{cases} 3x_1 + 4x_2 + 2x_3 = 8 \\ 2x_1 - x_2 - 3x_3 = -4 \\ x_1 + 5x_2 + x_3 = 0 \end{cases}$$

$$21. \begin{cases} x_1 + x_2 + x_3 = 1 \\ x_1 + 2x_2 + 2x_3 = 2 \\ 2x_1 + 3x_2 + 3x_3 = 3 \end{cases}$$

$$22. \begin{cases} x_1 + x_2 + 2x_3 = 4 \\ 2x_2 + x_3 = 3 \\ x_1 - x_2 = 2 \end{cases}$$

$$23. \begin{cases} x_1 + x_2 + x_3 = 1 \\ 8x_1 + 3x_2 - 6x_3 = 2 \\ 4x_1 + x_2 - 3x_3 = 3 \end{cases}$$

$$24. \begin{cases} 2x_1 + 3x_2 + 5x_3 = 10 \\ 3x_1 + 7x_2 + 4x_3 = 3 \\ x_1 + 2x_2 + 2x_3 = 3 \end{cases}$$

$$25. \begin{cases} 2x_1 + x_2 - 3x_3 = 4 \\ 4x_1 - x_2 = 2 \\ 2x_1 + 3x_2 - x_3 = 8 \end{cases}$$

$$26. \begin{cases} x_1 - 4x_2 - 2x_3 = -3 \\ 3x_1 + x_2 + x_3 = 5 \\ 3x_1 - 5x_2 - 6x_3 = -9 \end{cases}$$

$$27. \begin{cases} 5x_1 - 6x_2 + 4x_3 = 3 \\ 3x_1 - 3x_2 + 2x_3 = 2 \\ 4x_1 - 5x_2 + 2x_3 = 1 \end{cases}$$

$$28. \begin{cases} 7x_1 - 5x_2 + x_3 = 3 \\ 5x_1 - 2x_2 - x_3 = 2 \\ 2x_1 + x_2 = 3 \end{cases}$$

$$29. \begin{cases} 7x_1 - 5x_2 = 31 \\ 4x_1 + 11x_3 = -43 \\ 2x_1 + 3x_2 + 4x_3 = -20 \end{cases}$$

$$30. \begin{cases} 4x_1 - 3x_2 + 2x_3 = -4 \\ 6x_1 - 2x_2 + 3x_3 = -1 \\ 5x_1 - 3x_2 + 2x_3 = -3 \end{cases}$$

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$$1. \begin{pmatrix} -1 & -1 & 1 \\ 2 & 0 & -3 \\ 1 & 1 & 0 \end{pmatrix} \quad 2. \begin{pmatrix} 3 & -4 & 5 \\ 2 & -3 & 1 \\ 3 & -5 & -1 \end{pmatrix} \quad 3. \begin{pmatrix} 2 & 0 & 0 & 0 \\ 3 & 2 & 0 & 0 \\ 1 & 1 & 3 & 4 \\ 2 & -1 & 2 & 3 \end{pmatrix} \quad 4. \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & 1 & -1 \\ 1 & -1 & -1 & 1 \end{pmatrix}$$

$$5. \begin{pmatrix} 2 & -1 & 3 & -2 & 4 \\ 4 & -2 & 5 & 1 & 7 \\ 2 & -1 & 1 & 8 & 2 \end{pmatrix} \quad 6. \begin{pmatrix} 8 & 2 & 2 & -1 & 1 \\ 1 & 7 & 4 & -2 & 5 \\ -2 & 4 & 2 & -1 & 3 \end{pmatrix} \quad 7. \begin{pmatrix} 1 & 7 & 7 & 9 \\ 7 & 5 & 1 & -1 \\ 4 & 2 & -1 & -3 \\ -1 & 1 & 3 & 5 \end{pmatrix} \quad 8. \begin{pmatrix} 1 & 3 & 5 & -1 \\ 2 & -1 & -3 & 4 \\ 5 & 1 & -1 & 7 \\ 7 & 7 & 9 & 1 \end{pmatrix}$$

$$9. \begin{pmatrix} 4 & 1 & 7 & -5 & 1 \\ 0 & -7 & 1 & -3 & -5 \\ 3 & 4 & 5 & -3 & 2 \\ 2 & 5 & 3 & -1 & 3 \end{pmatrix} \quad 10. \begin{pmatrix} -6 & 4 & 8 & -1 & 6 \\ -5 & 2 & 4 & 1 & 3 \\ 7 & 2 & 4 & 1 & 3 \\ 2 & 4 & 8 & -7 & 6 \\ 3 & 2 & 4 & -5 & 3 \end{pmatrix}$$