Определитель матрицы

Ответы

1. **1.1.** 24. **1.2.** 0. **1.3.** −133. **1.4.** 9.

2. **2.1.** −2. **2.2.** 0. **2.3.** 0. **2.4.** −96. **2.5.** −160. **2.6.** 1440.

3. **3.1.** 0. **3.2.** 0. **3.3.** 0.

4. **4.1.** 3; 1. **4.2.** 1; $1 \pm 2\sqrt{3}$. **4.3.** 1. **4.4.** 1; −1. **4.5.** $x_1 = \sin\alpha$; $x_2 = \cos\alpha$.

5. **5.1.** 1; 3; 5. **5.2.** 0; 1; $\dfrac{-10 \pm 2\sqrt{531}}{23}$. **5.3.** 1; −1. **5.4.** $x \in \mathbb{R}$.

6. **6.1.** $x \in (0; +\infty)$. **6.2.** $x \in (-\infty; 9)$. **6.3.** $x \in (-7; -3)$.

7. **7.1.** 10. **7.2.** 12. **7.3.** $n!$.

Решения и комментарии

1.1. $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 1 \end{vmatrix} = (1\cdot5\cdot1 + 2\cdot6\cdot7 + 3\cdot4\cdot8) - (3\cdot5\cdot7 + 2\cdot4\cdot1 + 1\cdot6\cdot8) = (5 + 84 + 96) - (105 + 8 + 48) = 185 - 161 = 24$ $\boxed{24}$

1.2. $\begin{vmatrix} 1 & -1 & 1 \\ 2 & -2 & 2 \\ 3 & -3 & 3 \end{vmatrix} = (1\cdot(-2)\cdot3 + (-1)\cdot2\cdot3 + 1\cdot2\cdot(-3)) - (1\cdot(-2)\cdot3 + (-1)\cdot2\cdot3 + 1\cdot2\cdot(-3)) = (-6-6-6) - (-6-6-6) = -18+18 = 0$ $\boxed{0}$

1.3. $\begin{vmatrix} 0 & 7 & 7 \\ 3 & 2 & 1 \\ 1 & 1 & 7 \end{vmatrix} = (0\cdot2\cdot7 + 7\cdot1\cdot1 + 7\cdot3\cdot1) - (7\cdot2\cdot1 + 7\cdot3\cdot7 + 0\cdot1\cdot1) = (0+7+21) - (14+147+0) = 28 - 161 = -133$ $\boxed{-133}$

1.4. $\begin{vmatrix} 1 & 2 & 0 \\ 0 & 1 & 2 \\ 2 & 0 & 1 \end{vmatrix} = (1\cdot1\cdot1 + 2\cdot2\cdot2 + 0\cdot0\cdot0) - (0\cdot1\cdot2 + 2\cdot0\cdot1 + 1\cdot2\cdot0) = (1+8+0) - (0+0+0) = 9.$ $\boxed{9}$

2.1.

$$\begin{vmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & -1 \end{vmatrix} = (-1)^{1+2} \cdot 1 \cdot \begin{vmatrix} 1 & 1 & 0 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{vmatrix} =$$

$$= -1 \cdot (-1)^{3+3} \cdot (-1) \cdot \begin{vmatrix} 1 & 1 \\ 1 & -1 \end{vmatrix} = \boxed{-2}\ ?$$

$$= -1 - 1 = -2.$$

2.2.

$$\begin{vmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{vmatrix} = \begin{vmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & -1 & 0 & 1 \end{vmatrix} = (-1)^{1+1} \cdot 1 \cdot \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ -1 & 0 & 1 \end{vmatrix} =$$

$$= \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{vmatrix} = (-1)^{1+1} \cdot 1 \cdot \begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} = 0. \quad \boxed{0}$$

2.3.

$$\begin{vmatrix} 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ -1 & -1 & 1 & 1 \\ -1 & 1 & 1 & -1 \end{vmatrix} = \begin{vmatrix} 1 & 1 & -1 & -1 \\ 0 & -2 & 0 & 2 \\ 0 & 0 & 0 & 0 \\ -1 & 1 & 1 & -1 \end{vmatrix} = 0 \quad \boxed{0}$$

2.4.

$$\begin{vmatrix} 0 & 1 & 2 & 3 \\ 3 & 0 & 1 & 2 \\ 2 & 3 & 0 & 1 \\ 1 & 2 & 3 & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1 & 2 & 3 \\ 3 & 0 & 1 & 2 \\ 2 & 0 & -6 & -8 \\ 1 & 0 & -1 & -6 \end{vmatrix} = (-1)^{2+1} \cdot 1 \cdot \begin{vmatrix} 3 & 1 & 2 \\ 2 & -6 & -8 \\ 1 & -1 & -6 \end{vmatrix} =$$

$$= -1 \cdot \begin{vmatrix} 0 & 4 & 20 \\ 0 & -4 & 4 \\ 1 & -1 & -6 \end{vmatrix} = -1 \cdot (-1)^{1+3} \cdot 1 \cdot \begin{vmatrix} 4 & 20 \\ -4 & 4 \end{vmatrix} =$$

$$= -1 \cdot (16 + 80) = -96.$$

2.5.

$$\begin{vmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 2 & 3 \\ 3 & 4 & 1 & 2 \\ 2 & 3 & 4 & 1 \end{vmatrix} = \begin{vmatrix} 1 & 2 & 3 & 4 \\ 0 & -7 & -10 & -13 \\ 0 & -2 & -8 & -10 \\ 0 & -1 & -2 & -7 \end{vmatrix} = (-1)^{1+1} \cdot 1 \cdot \begin{vmatrix} -7 & -10 & -13 \\ -2 & -8 & -10 \\ -1 & -2 & -7 \end{vmatrix} =$$

$$= -1 \cdot \begin{vmatrix} 7 & 10 & 13 \\ 2 & 8 & 10 \\ 1 & 2 & 7 \end{vmatrix} = -1 \cdot \begin{vmatrix} 0 & -4 & -36 \\ 0 & 4 & -4 \\ 1 & 2 & 7 \end{vmatrix} =$$

$$= -1 \cdot 1 \cdot (-1)^{1+3} \cdot \begin{vmatrix} -4 & -36 \\ 4 & -4 \end{vmatrix} = \quad \boxed{-160}$$

$$= -1 \cdot (16 + 144) = -160$$

$$\begin{vmatrix} 1 & 1 & 1 & 1 \\ 2 & 4 & 8 & 16 \\ 3 & 9 & 27 & 81 \\ 5 & 25 & 125 & 625 \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 & 0 \\ 2 & 2 & 6 & 14 \\ 3 & 6 & 24 & 78 \\ 5 & 20 & 120 & 620 \end{vmatrix} = (-1)^{1+1}\cdot 1\cdot \begin{vmatrix} 2 & 6 & 14 \\ 6 & 24 & 78 \\ 20 & 120 & 620 \end{vmatrix} =$$

$$= 2\cdot 6\cdot 20\cdot \begin{vmatrix} 1 & 3 & 7 \\ 1 & 4 & 13 \\ 1 & 6 & 31 \end{vmatrix} = 240\cdot \begin{vmatrix} 1 & 3 & 7 \\ 0 & 1 & 6 \\ 0 & 3 & 24 \end{vmatrix} =$$

$$= 240\cdot(-1)^{1+1}\cdot 1\cdot \begin{vmatrix} 1 & 6 \\ 3 & 24 \end{vmatrix} = 240\cdot(24-18) = 1440.$$

$\boxed{1440}$

2.6.

$$\begin{vmatrix} 16 & 3 & 2 & 13 \\ 5 & 10 & 11 & 8 \\ 9 & 6 & 7 & 12 \\ 4 & 15 & 14 & 1 \end{vmatrix} = \begin{vmatrix} 0 & -57 & -54 & 9 \\ 1 & -5 & -3 & 7 \\ 1 & -24 & -21 & 10 \\ 4 & 15 & 14 & 1 \end{vmatrix} = \begin{vmatrix} 0 & -57 & -54 & 9 \\ 1 & -5 & -3 & 7 \\ 0 & -19 & -18 & 3 \\ 0 & 35 & 26 & -27 \end{vmatrix} = \begin{vmatrix} 0 & 0 & 0 & 0 \\ 1 & -5 & -3 & 7 \\ 0 & -19 & -18 & 3 \\ 0 & 35 & 26 & -27 \end{vmatrix} = 0$$

3.1.

$$\begin{vmatrix} 7 & 14 & 2 & 11 \\ 12 & 1 & 13 & 8 \\ 9 & 4 & 16 & 5 \\ 6 & 15 & 3 & 10 \end{vmatrix} = \begin{vmatrix} -2 & 10 & -14 & 6 \\ 0 & -29 & 7 & -12 \\ 9 & 4 & 16 & 5 \\ 6 & 15 & 3 & 10 \end{vmatrix} = -2\cdot \begin{vmatrix} 1 & -5 & 7 & -3 \\ 0 & -29 & 7 & -12 \\ 3 & -11 & 13 & -5 \\ 6 & 15 & 3 & 10 \end{vmatrix} = -2\cdot \begin{vmatrix} 1 & -5 & 7 & -3 \\ 0 & -29 & 7 & -12 \\ 3 & -11 & 13 & -5 \\ 0 & 37 & -23 & 20 \end{vmatrix} =$$

$$= -2\cdot \begin{vmatrix} 1 & -5 & 7 & -3 \\ 0 & -29 & 7 & -12 \\ 0 & 4 & -8 & 4 \\ 0 & 37 & -23 & 20 \end{vmatrix} = -2\cdot(-1)^{1+1}\cdot 1\cdot \begin{vmatrix} -29 & 7 & -12 \\ 4 & -8 & 4 \\ 37 & -23 & 20 \end{vmatrix} = -2\cdot \begin{vmatrix} -37 & 23 & -20 \\ 4 & -8 & 4 \\ 37 & -23 & 20 \end{vmatrix} = 0.$$

3.2.

$$\begin{vmatrix} 8 & 10 & 3 & 13 \\ 15 & 6 & 1 & 12 \\ 2 & 11 & 16 & 5 \\ 9 & 7 & 14 & 4 \end{vmatrix} = \begin{vmatrix} 0 & -34 & -61 & -7 \\ 1 & -71 & -111 & -23 \\ 2 & 11 & 16 & 5 \\ 1 & -37 & -50 & -16 \end{vmatrix} = \begin{vmatrix} 0 & -34 & -61 & -7 \\ 1 & -37 & -50 & -16 \\ 2 & 11 & 16 & 5 \\ 1 & -37 & -50 & -16 \end{vmatrix} = 0$$

3.3.

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & 1 & 1 \\ 1 & 3 & 9 \end{vmatrix} = 0$$

$$1\cdot \begin{vmatrix} 1 & 1 \\ 3 & 9 \end{vmatrix} - x\cdot \begin{vmatrix} 1 & 1 \\ 1 & 9 \end{vmatrix} + x^2\cdot \begin{vmatrix} 1 & 1 \\ 1 & 3 \end{vmatrix} = 0$$

$$6 - x\cdot 8 + x^2\cdot 2 = 0 \;\Big|\, :2$$

$$x^2 - 4x + 3 = 0$$

$$(x-3)(x-1) = 0$$

$$\left[\begin{aligned} x &= 3 \\ x &= 1 \end{aligned}\right.$$

Ответ: 3; 1;

4.1.

4.2.

$$\begin{vmatrix} 1 & 3 & 9 \\ 1 & x & 1 \\ 1 & 1 & x^2 \end{vmatrix} = 0$$

$$x^3+3+9-9x-3x^2-1=0.$$

$$x^3-3x^2-9x+11=0.$$

	1	-3	-9	11
1	1	-2	-11	0

$$(x-1)(x^2-2x-11)=0.$$

$$D = 4+44 = 48 = 16\cdot 3.$$

$$x = \frac{2 \pm 4\sqrt{3}}{2} = 1 \pm 2\sqrt{3}$$

Ответ: $1;\ 1 \pm 2\sqrt{3}$.

4.3.

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & 2 & 3 \\ 4 & 5 & 6 \end{vmatrix} = 0.$$

$$1\cdot\begin{vmatrix} 2 & 3 \\ 5 & 6 \end{vmatrix} - x\cdot\begin{vmatrix} 1 & 3 \\ 4 & 6 \end{vmatrix} + x^2\begin{vmatrix} 1 & 2 \\ 4 & 5 \end{vmatrix} = 0$$

$$-3 - x\cdot(-6) + x^2\cdot(-3) = 0 \quad |:(-3)$$

$$x^2 - 2x + 1 = 0$$

$$x = 1 \ (2к).$$

Ответ: $\boxed{1}$.

4.4.

$$\begin{vmatrix} \cos\alpha & \sin\alpha & 1 \\ -\sin\alpha & \cos\alpha & x \\ \cos\alpha & \sin\alpha & x^2 \end{vmatrix} = 0$$

$$1\cdot\begin{vmatrix} -\sin\alpha & \cos\alpha \\ \cos\alpha & \sin\alpha \end{vmatrix} - x\cdot\begin{vmatrix} \cos\alpha & \sin\alpha \\ \cos\alpha & \sin\alpha \end{vmatrix} + x^2\cdot\begin{vmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{vmatrix} = 0$$

$$1\cdot(-\sin^2\alpha - \cos^2\alpha) - x\cdot 0 + x^2\cdot(\cos^2\alpha + \sin^2\alpha) = 0.$$

$$x^2 - 1 = 0 \Rightarrow x = \pm 1.$$

Ответ: $\boxed{\pm 1}$

4.5.

$$\begin{vmatrix} x & x^2 & 1 \\ \cos\alpha & \cos^2\alpha & 1 \\ \sin\alpha & \sin^2\alpha & 1 \end{vmatrix} = 0$$

$$x\cdot\begin{vmatrix} \cos^2\alpha & 1 \\ \sin^2\alpha & 1 \end{vmatrix} - x^2\begin{vmatrix} \cos\alpha & 1 \\ \sin\alpha & 1 \end{vmatrix} + 1\cdot\begin{vmatrix} \cos\alpha & \cos^2\alpha \\ \sin\alpha & \sin^2\alpha \end{vmatrix} = 0$$

$$x\cdot(\cos^2\alpha - \sin^2\alpha) - x^2\cdot(\cos\alpha - \sin\alpha) + \sin\alpha\cos\alpha(\sin\alpha - \cos\alpha) = 0 \quad |\cdot(-1)$$

$$x^2\cdot(\cos\alpha - \sin\alpha) - x\cdot(\cos\alpha - \sin\alpha)(\cos\alpha + \sin\alpha) + \sin\alpha\cos\alpha\cdot(\cos\alpha - \sin\alpha) = 0$$

$$\sin\alpha = \cos\alpha \Rightarrow x \in \mathbb{R}; \quad \sin\alpha \neq \cos\alpha \Rightarrow x^2 - x\cdot(\sin\alpha + \cos\alpha) + \sin\alpha\cdot\cos\alpha = 0$$

Т. Виета: $x = \sin\alpha;\ x = \cos\alpha.$

5.1.

$$\begin{vmatrix} 1 & x & x^2 & x^3 \\ 1 & 1 & 1 & 1 \\ 1 & 3 & 9 & 27 \\ 1 & 5 & 25 & 125 \end{vmatrix} = 0$$

$$\begin{vmatrix} 1 & x & x^2 & x^3 \\ 1 & 1 & 1 & 1 \\ 1 & 3 & 9 & 27 \\ 1 & 5 & 25 & 125 \end{vmatrix} = \begin{vmatrix} 0 & x-1 & x^2-1 & x^3-1 \\ 1 & 1 & 1 & 1 \\ 0 & 2 & 8 & 26 \\ 0 & 4 & 24 & 124 \end{vmatrix} = 1\cdot(-1)^{2+1}\cdot\begin{vmatrix} x-1 & (x-1)(x+1) & (x-1)(x^2+x+1) \\ 2 & 8 & 26 \\ 4 & 24 & 124 \end{vmatrix} =$$

$$= -1\cdot(x-1)\cdot 2\cdot 4\cdot\begin{vmatrix} 1 & x+1 & x^2+x+1 \\ 1 & 4 & 13 \\ 1 & 6 & 31 \end{vmatrix} = 8\cdot(1-x)\cdot\begin{vmatrix} 0 & x-3 & x^2+x-12 \\ 1 & 4 & 13 \\ 0 & 2 & 18 \end{vmatrix} =$$

$$= 8\cdot(1-x)\cdot 1\cdot(-1)^{2+1}\cdot\begin{vmatrix} x-3 & (x-3)(x+4) \\ 2 & 18 \end{vmatrix} = 8\cdot(x-1)\cdot(x-3)\cdot 2\cdot\begin{vmatrix} 1 & x+4 \\ 1 & 9 \end{vmatrix} =$$

$$= 16\cdot(x-1)(x-3)\cdot(9-x-4) = 0 \Rightarrow x=1;\ x=3;\ x=5.$$

$$\begin{vmatrix} 1+x & 1+x^2 & 1+x^3 & 1+x^4 \\ 2 & 5 & 9 & 17 \\ -1 & 3 & -7 & 17 \\ 1 & 1 & 1 & 1 \end{vmatrix} = 0$$

$$\begin{vmatrix} 1+x & 1+x^2 & 1+x^3 & 1+x^4 \\ 2 & 5 & 9 & 17 \\ -1 & 3 & -7 & 17 \\ 1 & 1 & 1 & 1 \end{vmatrix} = \begin{vmatrix} x & x^2 & x^3 & x^4 \\ 0 & 3 & 7 & 15 \\ 0 & 4 & -6 & 18 \\ 1 & 1 & 1 & 1 \end{vmatrix} =$$

$$= x \cdot \begin{vmatrix} 1 & x & x^2 & x^3 \\ 0 & 3 & 7 & 15 \\ 0 & 4 & -6 & 18 \\ 1 & 1 & 1 & 1 \end{vmatrix} = x \cdot \begin{vmatrix} 0 & x-1 & x^2-1 & x^3-1 \\ 0 & 3 & 7 & 15 \\ 0 & 4 & -6 & 18 \\ 1 & 1 & 1 & 1 \end{vmatrix} = x \cdot 1 \cdot (-1)^{4+1} \cdot \begin{vmatrix} x-1 & x^2-1 & x^3-1 \\ 3 & 7 & 15 \\ 4 & -6 & 18 \end{vmatrix} = x \cdot (1-x) \cdot 2 \cdot \begin{vmatrix} 1 & x+1 & x^2+x+1 \\ 3 & 7 & 15 \\ 2 & -3 & 9 \end{vmatrix} =$$

$$= 2x \cdot (1-x) \cdot \begin{vmatrix} 1 & x+1 & x^2+x+1 \\ 1 & 10 & 6 \\ 2 & -3 & 9 \end{vmatrix} = 2x \cdot (1-x) \cdot \begin{vmatrix} 0 & x-9 & x^2+x-5 \\ 1 & 10 & 6 \\ 0 & -23 & -3 \end{vmatrix} = 2x \cdot (1-x) \cdot 1 \cdot (-1)^{2+1} \cdot \begin{vmatrix} x-9 & x^2+x-5 \\ -23 & -3 \end{vmatrix} =$$

$$= 2x \cdot (1-x) \cdot \begin{vmatrix} x-9 & x^2+x-5 \\ 23 & 3 \end{vmatrix} = 2x \cdot (1-x) \cdot (3x - 27 - 23x^2 - 23x + 115) = 0 \quad \left[\begin{array}{l} x = 0 \\ x = 1 \\ -23x^2 - 20x + 88 = 0 \end{array}\right.$$

Ответ: $x = 0;\ x = 1;\ x = \frac{-10 \pm 2\sqrt{531}}{23}$. $\quad D = 16 \cdot 531 \quad x = \frac{20 \pm 4\sqrt{531}}{-2 \cdot 23}$

5.2.

$$\begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & x & x \\ 1 & x & 0 & x \\ 1 & x & x & 0 \end{vmatrix} = -3$$

$$\begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & x & x \\ 1 & x & 0 & x \\ 1 & x & x & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & x & x \\ 1 & x & 0 & x \\ 1 & x & x & 0 \end{vmatrix} = \begin{vmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & x & x \\ 0 & x & -x & 0 \\ 0 & x & 0 & -x \end{vmatrix} =$$

$$= 1 \cdot (-1)^{2+1} \cdot \begin{vmatrix} 1 & 1 & 1 \\ x & -x & 0 \\ x & 0 & -x \end{vmatrix} = -1 \cdot x \cdot x \cdot \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{vmatrix} = -x^2 \cdot (1+1+1) = -3$$

$$x^2 = 1 \quad \boxed{x = \pm 1}$$

5.3.

$$\begin{vmatrix} 1+x & 1+2x & 1+3x & 1+4x \\ 1+x^2 & 1+2x^2 & 1+3x^2 & 1+4x^2 \\ 1+x^3 & 1+2x^3 & 1+3x^3 & 1+4x^3 \\ 1+x^4 & 1+2x^4 & 1+3x^4 & 1+4x^4 \end{vmatrix} = 0 \quad \begin{vmatrix} 1+x & 1+2x & 1+3x & 1+4x \\ 1+x^2 & 1+2x^2 & 1+3x^2 & 1+4x^2 \\ 1+x^3 & 1+2x^3 & 1+3x^3 & 1+4x^3 \\ 1+x^4 & 1+2x^4 & 1+3x^4 & 1+4x^4 \end{vmatrix} =$$

$$= \begin{vmatrix} 1+x & x & 2x & 3x \\ 1+x^2 & x^2 & 2x^2 & 3x^2 \\ 1+x^3 & x^3 & 2x^3 & 3x^3 \\ 1+x^4 & x^4 & 2x^4 & 3x^4 \end{vmatrix} = \begin{vmatrix} 1+x & x & 0 & 0 \\ 1+x^2 & x^2 & 0 & 0 \\ 1+x^3 & x^3 & 0 & 0 \\ 1+x^4 & x^4 & 0 & 0 \end{vmatrix} = 0 \quad x \in \mathbb{R}$$

5.4.

$$\begin{vmatrix} 0 & 1 & 0 \\ 1 & 0 & 3 \\ 0 & 0 & x \end{vmatrix} < 0 \qquad x \cdot (-1)^{3+3} \cdot \begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix} = -x < 0 \Rightarrow x > 0$$

Ответ: $x \in (0; +\infty)$.

6.1.

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & x \end{vmatrix} > 0$$

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & x \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 \\ 4 & -3 & -6 \\ 7 & -6 & x-21 \end{vmatrix} = 1\cdot(-1)^{1+1}\cdot\begin{vmatrix} -3 & -6 \\ -6 & x-21 \end{vmatrix} =$$

$$= -3\cdot(-1)\cdot\begin{vmatrix} 1 & 2 \\ 6 & 21-x \end{vmatrix} = 3\cdot(21-x-12) = 3(9-x) > 0$$

$$x < 9$$

Ответ: $x \in (-\infty; 9)$.

6.2.

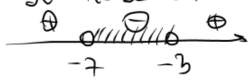
$$\begin{vmatrix} 1 & x+2 & 2 \\ 2 & 1 & 1 \\ -x & -2 & 5 \end{vmatrix} > 0.$$

$$\begin{vmatrix} 1 & x+2 & 2 \\ 2 & 1 & 1 \\ -x & -2 & 5 \end{vmatrix} = \begin{vmatrix} -3 & x & 2 \\ 0 & 0 & 1 \\ -x-10 & -7 & 5 \end{vmatrix} =$$

$$= 1\cdot(-1)^{2+3}\cdot\begin{vmatrix} -3 & x \\ -x-10 & -7 \end{vmatrix} = \begin{vmatrix} -3 & x \\ x+10 & 7 \end{vmatrix} = -21 - x(x+10) =$$

$$= -x^2 - 10x - 21 > 0 \Rightarrow x^2 + 10x + 21 < 0$$

$$(x+7)(x+3) < 0$$



Ответ: $x \in (-7; -3)$.

6.3.