$W_{\kappa_2} =$

ДЗ по ЛА

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вариант 7

№3

а) $6x^2+3y^2-4xy+4\sqrt{5}x+8\sqrt{5}y+22=0$

Кв. форма: $f=6x^2+3y^2-4xy$

$A=\begin{pmatrix}6 & -2\\ -2 & 3\end{pmatrix}$

$\begin{vmatrix}6-\lambda & -2\\ -2 & 3-\lambda\end{vmatrix}=0$

$\lambda^2-9\lambda+14=0$, $\lambda_1=2$, $\lambda_2=7$

1) $\lambda_1=2$

$(A-\lambda_1 E)\bar{u}=0 \iff \begin{pmatrix}4 & -2\\ -2 & 1\end{pmatrix}\begin{pmatrix}u_1\\ u_2\end{pmatrix}=\begin{pmatrix}0\\ 0\end{pmatrix}$

$\begin{pmatrix}4 & -2\\ -2 & 1\end{pmatrix}\sim\begin{pmatrix}2 & -1\\ 0 & 0\end{pmatrix} \Rightarrow 2u_1-u_2=0$

$u_1=\frac{c_1}{2}$; u_1 - базис, u_2 - свобод. $u_2=c_1 \Rightarrow$

$\Rightarrow \bar{u}=c_1\begin{pmatrix}\frac{1}{2}\\ 1\end{pmatrix}$, пусть $\bar{a}_1=\begin{pmatrix}\frac{1}{2}\\ 1\end{pmatrix}$, $|\bar{a}_1|=\frac{\sqrt{5}}{2}$

$c_1=\frac{2}{\sqrt{5}} \Rightarrow$

$$\Rightarrow \bar{u} = \frac{2}{\sqrt{5}} \begin{pmatrix} \frac{1}{2} \\ 1 \end{pmatrix}$$

2) $\lambda_2 = 7$

$$(A - \lambda_2 E)\bar{v} = 0 \Leftrightarrow \begin{pmatrix} -1 & -2 \\ -2 & -4 \end{pmatrix} \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} -1 & -2 \\ -2 & -4 \end{pmatrix} \sim \begin{pmatrix} -1 & -2 \\ 0 & 0 \end{pmatrix} \Rightarrow -v_1 - 2v_2 = 0$$

$$v_1 = -2v_2$$

$$v_1 = -2c_2$$

v_1 - базис, v_2 - свобод., $v_2 = c_2$

$\bar{v} = c_2 \begin{pmatrix} -2 \\ 1 \end{pmatrix}$, пусть $\bar{a}_2 = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$, $|\bar{a}_2| = \sqrt{5}$

$c_2 = \frac{1}{\sqrt{5}}$; $\bar{v} = \frac{1}{\sqrt{5}} \begin{pmatrix} -2 \\ 1 \end{pmatrix}$

В базисе $\bar{u}, \bar{v}$ кв. форма $f = 2x_1^2 + 7y_1$

Матрица перехода:

$$T = \begin{pmatrix} \frac{1}{\sqrt{5}} & -\frac{2}{\sqrt{5}} \\ \frac{2}{\sqrt{5}} & \frac{1}{\sqrt{5}} \end{pmatrix} \quad \det T = 1.$$

Замена переменных:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{1}{\sqrt5} & -\frac{2}{\sqrt5} \\ \frac{2}{\sqrt5} & \frac{1}{\sqrt5} \end{pmatrix} \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$$

$$\begin{cases} x = \frac{1}{\sqrt5}x_1 - \frac{2}{\sqrt5}y_1 \\ y = \frac{2}{\sqrt5}x_1 + \frac{1}{\sqrt5}y_1 \end{cases} \Rightarrow$$

$$\Rightarrow 2x_1^2 + 7y_1^2 + 4\sqrt5\left(\frac{1}{\sqrt5}x_1 - \frac{2}{\sqrt5}y_1\right) + 8\sqrt5\left(\frac{2}{\sqrt5}x_1 + \frac{1}{\sqrt5}\right) +$$

$$+22 = 0$$

$$2x_1^2 + 7y_1^2 + 20x_1 + 22 = 0$$

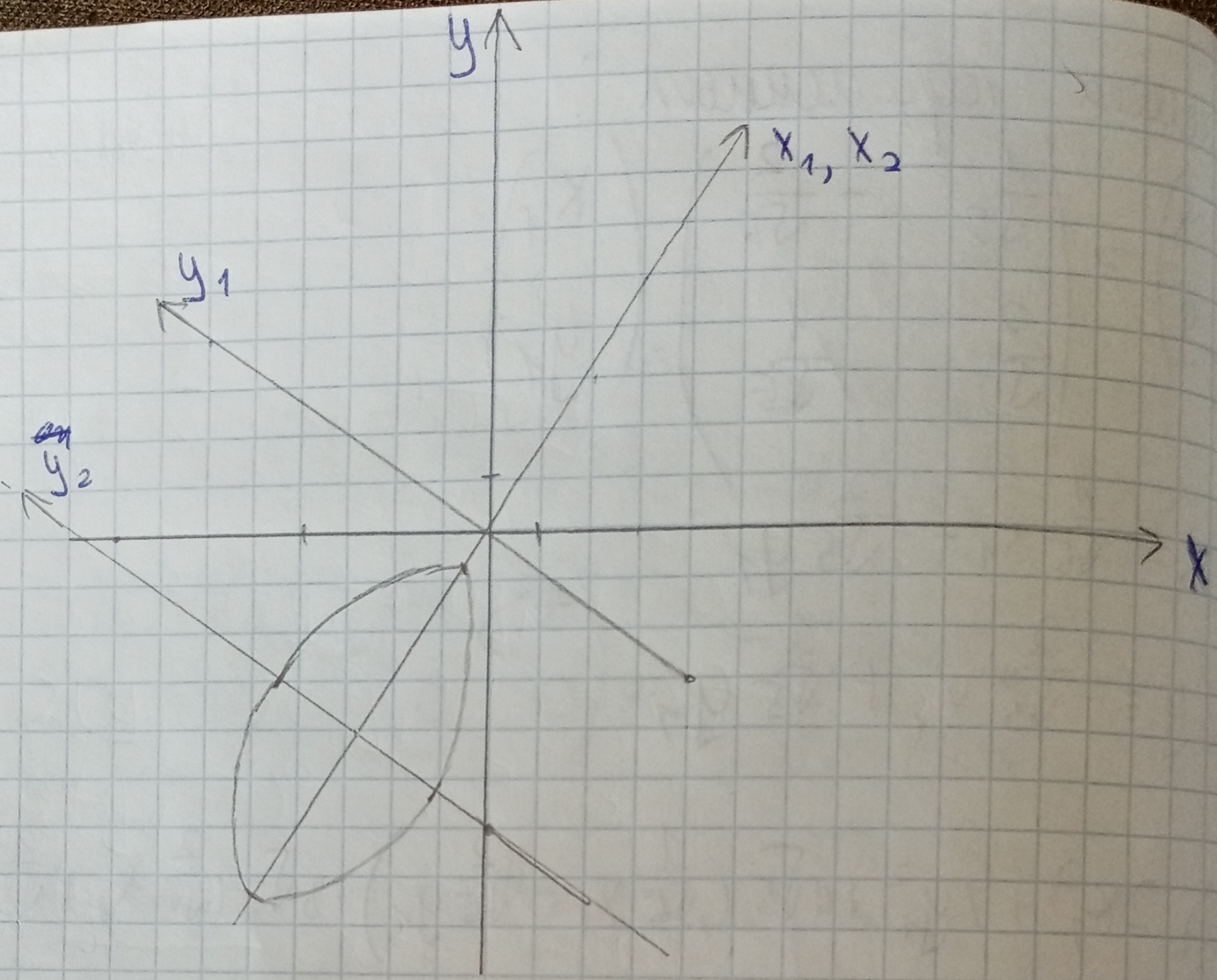
$$2(x_1^2 + 10x_1 + 25) - 28 + 7y_1^2 = 0$$

$$2(x_1+5)^2 + 7y_1^2 = 28$$

$$\frac{(x_1+5)^2}{14} + \frac{y_1^2}{4} = 1$$

$$\begin{cases} x_2 = x+5 \\ y_1 = y_2 \end{cases} \Rightarrow \frac{x_2^2}{14} + \frac{y_2^2}{4} = 1 \text{ – эллипс}$$

$a = \sqrt{14}$; $b = 2$.



8) $-7x^2+y^2-6xy+2\sqrt{10}x-6\sqrt{10}y+42=0$

$f=-7x^2+y^2-6x^2$

$A=\begin{pmatrix} -7 & -3 \\ -3 & 1 \end{pmatrix}$; $\begin{vmatrix} -7-\lambda & -3 \\ -3 & 1-\lambda \end{vmatrix}=0$

$\lambda_1=-8$; $\lambda_2=2$

1) $\lambda_1=-8$

$(A-\lambda_1 E)\bar{u}=0 \Leftrightarrow \begin{pmatrix} 1 & -3 \\ -3 & 9 \end{pmatrix}\begin{pmatrix} u_1 \\ u_2 \end{pmatrix}=\begin{pmatrix} 0 \\ 0 \end{pmatrix}$

$$\begin{pmatrix} 1 & -3 \\ -3 & 9 \end{pmatrix} \sim \begin{pmatrix} 1 & -3 \\ 0 & 0 \end{pmatrix} \Rightarrow u_1 - 3u_2 = 0$$

u_1 - базис, u_2 - свобод.

$u_1 = 3C_1$ $\quad u_2 = C_1$

$\overline{u} = C_1 \begin{pmatrix} 3 \\ 1 \end{pmatrix}$, пусть $\overline{a}_1 = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$, $|\overline{a}_1| = \sqrt{10}$, $C_1 = \frac{1}{\sqrt{10}}$

$$\overline{u} = \frac{1}{\sqrt{10}} \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

2) $\lambda_2 = 2$.

$$(A - \lambda_2 E)\,\overline{v} = 0 \Rightarrow \begin{pmatrix} -9 & -3 \\ -3 & 1 \end{pmatrix} \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} -9 & -3 \\ -3 & -1 \end{pmatrix} \sim \begin{pmatrix} 3 & 1 \\ 0 & 0 \end{pmatrix} \Rightarrow 3v_1 + v_2 = 0;$$

v_1 - базис, v_2 - свобод.

$v_1 = -\frac{1}{3}C_2$; $v_2 = C_2$

$\overline{v} = C_2 \begin{pmatrix} -\frac{1}{3} \\ 1 \end{pmatrix}$, пусть $\overline{a}_2 = \begin{pmatrix} -\frac{1}{3} \\ 1 \end{pmatrix}$, $|\overline{a}_2| = \frac{\sqrt{10}}{3}$;

$C_2 = \frac{3}{\sqrt{10}}$

$$\overline{v} = \frac{3}{\sqrt{10}} \begin{pmatrix} -\frac{1}{3} \\ 1 \end{pmatrix}$$

В базисе $\overline{u}, \overline{v}$ $\quad f = -8x^2 + 2y^2$

Матрица перехода:

$$T = \begin{pmatrix} \frac{3}{\sqrt{10}} & -\frac{1}{\sqrt{10}} \\ \frac{1}{\sqrt{10}} & \frac{3}{\sqrt{10}} \end{pmatrix} \quad \det T = 1$$

Замена переменных:

$$\begin{cases} x = \frac{3}{\sqrt{10}} x_1 - \frac{1}{\sqrt{10}} y_1 \\ y = \frac{1}{\sqrt{10}} x_1 + \frac{3}{\sqrt{10}} y_1 \end{cases}$$

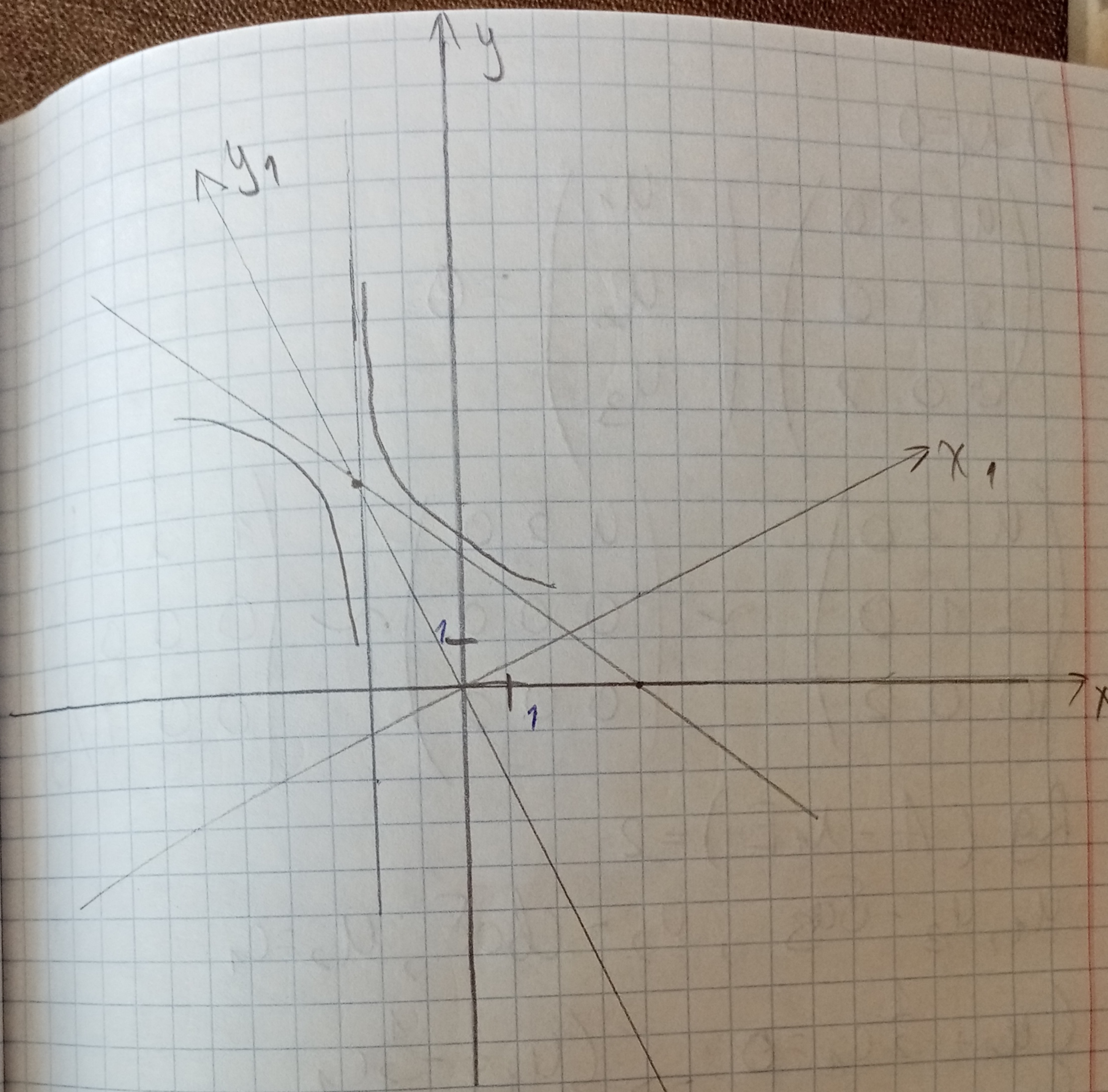
$$-8x_1^2 + 2y_1^2 - 20y_1 + 42 = 0$$

$$2(y_1^2 - 20y_1 + 25) - 8x_1^2 - 8 = 0$$

$$2(y_1 - 5)^2 - 8x_1^2 = 8$$

$$\frac{(y_1 - 5)^2}{4} - x_1^2 = 1$$ – гипербола

$$\begin{cases} x_2 = x_1 \\ y_2 = y_1 - 5 \end{cases} \Rightarrow \frac{y_2^2}{4} - \frac{x_2^2}{1} = 1$$



c) $4x^2+y^2+2z^2+4xy+2\sqrt{5}x-4\sqrt{5}y-4z-18=0$

$f=4x^2+y^2+2z^2+4xy$

$$A=\begin{pmatrix}4 & 2 & 0\\ 2 & 1 & 0\\ 0 & 0 & 2\end{pmatrix}$$

$$\begin{vmatrix}4-\lambda & 2 & 0\\ 2 & 1-\lambda & 0\\ 0 & 0 & 2-\lambda\end{vmatrix}=0$$

$\lambda_1=0$

$\lambda_2=2$

$\lambda_3=5$

1) $\lambda_1 = 0$

$$\begin{pmatrix}4 & 2 & 0\\ 2 & 1 & 0\\ 0 & 0 & 2\end{pmatrix}\begin{pmatrix}u_1\\ u_2\\ u_3\end{pmatrix} = 0$$

$$\begin{pmatrix}4 & 2 & 0\\ 2 & 1 & 0\\ 0 & 0 & 2\end{pmatrix} \sim \begin{pmatrix}4 & 2 & 0\\ 0 & 0 & 0\\ 0 & 0 & 2\end{pmatrix} \sim \begin{pmatrix}1 & \frac{1}{2} & 0\\ 0 & 0 & 0\\ 0 & 0 & 1\end{pmatrix}$$

$Rg(A - \lambda_1 E) = 2$

u_1, u_3 – баз; u_2 – своб; $u_2 = c_1$

$$\begin{cases} u_1 + \frac{1}{2}c_1 = 0 \\ u_3 = 0 \end{cases} \Rightarrow \begin{cases} u_1 = -\frac{1}{2}c_1 \\ u_3 = 0 \end{cases}$$

$\bar{u} = \begin{pmatrix}-\frac{1}{2}\\ 1\\ 0\end{pmatrix} c_1$; пусть $\bar{a}_1 = \begin{pmatrix}-\frac{1}{2}\\ 1\\ 0\end{pmatrix}$ $\quad |\bar{a}_1| = \ldots$ $\quad c_1 = \ldots$

$$\bar{u} = \frac{2}{\sqrt{5}}\begin{pmatrix}-\frac{1}{2}\\ 1\\ 0\end{pmatrix}$$

0
0
1

$|\bar{a}_1| = \frac{\sqrt{5}}{2}$

$c_1 = \frac{2}{\sqrt{5}}$

2) $\lambda_2 = 2$

$$\begin{pmatrix} 2 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} 1 & 1 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} 1 & 1 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 2 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \quad rg(A - \lambda_2 E) = 2$$

v_1, v_2 – базис, v_3 – свобод; $v_3 = c_2$

$$\begin{cases} v_1 + v_2 = 0 \\ v_1 - v_2 \end{cases} \Rightarrow \begin{cases} v_1 = 0 \\ v_3 = 0 \end{cases}$$

$\bar{v} = \begin{pmatrix} 0 \\ 0 \\ c_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} c_2$; пусть $a_2 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$, $|\bar{a}_2| = 1$,

$c_2 = 1$.

$\bar{v} = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$

3) $\lambda_3 = 5$

$$\begin{pmatrix}-1 & 2 & 0\\ 2 & -4 & 0\\ 0 & 0 & -3\end{pmatrix}\begin{pmatrix}w_1\\ w_2\\ w_3\end{pmatrix}=\begin{pmatrix}0\\ 0\\ 0\end{pmatrix}$$

$$\begin{pmatrix}-1 & 2 & 0\\ 2 & -4 & 0\\ 0 & 0 & -3\end{pmatrix}\sim\begin{pmatrix}-1 & 2 & 0\\ 0 & 0 & -3\\ 0 & 0 & 0\end{pmatrix}\sim\begin{pmatrix}-1 & 2 & 0\\ 0 & 0 & 1\\ 0 & 0 & 0\end{pmatrix}$$

$rg(A-\lambda_3 E) = 2$

w_1, w_3 − базис, w_2 − свобод., $w_2 = c_3$

$$\begin{cases}-w_1 + 2c_3 = 0\\ -w_3 = 0\end{cases} \Rightarrow \begin{cases}w_1 = 2c_3\\ w_3 = 0\end{cases}$$

$\overline{w} = c_3\begin{pmatrix}2\\ 1\\ 0\end{pmatrix}$, пусть $\overline{a}_3 = \begin{pmatrix}2\\ 1\\ 0\end{pmatrix}$, $|\overline{a}| = \sqrt{5}$, $c_3 = \frac{1}{\sqrt{5}}$

$$w = \frac{1}{\sqrt{5}}\begin{pmatrix}2\\ 1\\ 0\end{pmatrix}$$

$$\begin{pmatrix} -1 & 2 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}$$

$w_2 = c_3$

$|\bar{a}| = \sqrt{5}$

$c_3 = \frac{1}{\sqrt{5}}$

Матрица перехода:

$$T = \begin{pmatrix} -\frac{1}{\sqrt{5}} & 0 & \frac{2}{\sqrt{5}} \\ \frac{2}{\sqrt{5}} & 0 & \frac{1}{\sqrt{5}} \\ 0 & 1 & 0 \end{pmatrix} \qquad \det T = 1$$

Замена переменных:

$$\begin{cases} x = -\frac{1}{\sqrt{5}} x_1 + \frac{2}{\sqrt{5}} z_1 \\ y = \frac{2}{\sqrt{5}} x_1 + \frac{1}{\sqrt{5}} z_1 \\ z = y_1 \end{cases}$$

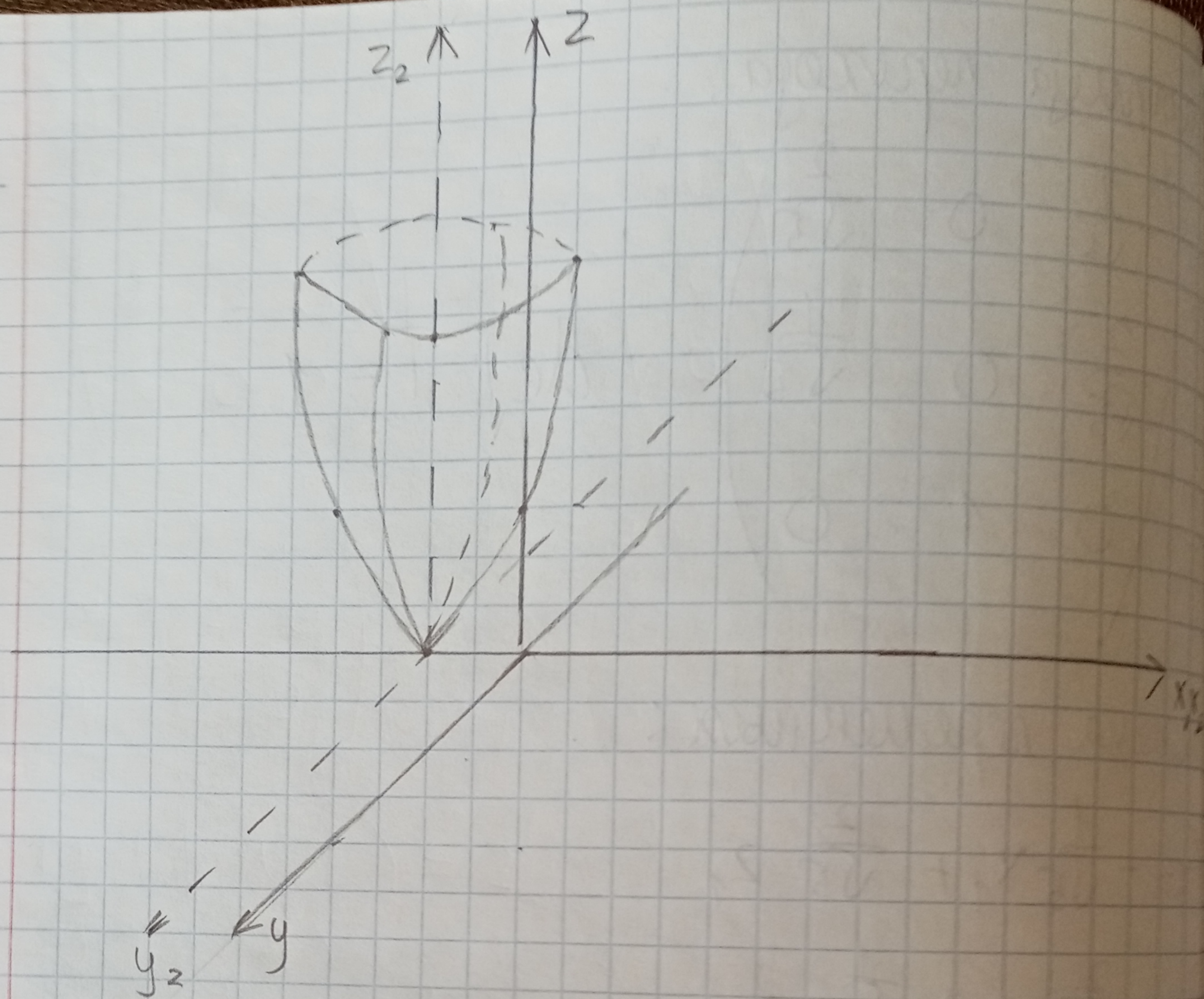
$$2y_1^2 + 5z_1^2 - 10x_1 - 4y_1 - 18 = 0$$

$$2(y_1^2 - 2y_1 + 1) + 5z_1^2 - 10x_1 - 20 = 0$$

$$2(y_1 - 1)^2 + 5z_1^2 = 10x_1 + 20$$

$$\frac{(y_1 - 1)^2}{5} + \frac{z_1^2}{2} = x_1 + 2.$$

$$\begin{cases} x_2 = x_1 + 2 \\ y_2 = y_1 - 1 \\ z_2 = z_1 \end{cases} \qquad \frac{y_2^2}{5} + \frac{z_2^2}{2} = x_2 \text{ — эллиптический параболоид}$$



d) $5x^2+3y^2+7z^2+8xy-8xz-10x-20y-20z+45=0$

$f = 5x^2+3y^2+7z^2+8xy-8xz$

$$A = \begin{pmatrix} 5 & 4 & -4 \\ 4 & 3 & 0 \\ -4 & 0 & 7 \end{pmatrix}$$

$$\begin{vmatrix} 5-\lambda & 4 & -4 \\ 4 & 3-\lambda & 0 \\ -4 & 0 & 7-\lambda \end{vmatrix} = 0; \quad \lambda_1 = -1; \ \lambda_2 = 5; \ \lambda_3 = $$

1) $\lambda = 1$

$$\begin{pmatrix} 6 & 4 & -4 \\ 4 & 4 & 0 \\ -4 & 0 & 8 \end{pmatrix} \sim \begin{pmatrix} 1 & \frac{2}{3} & -\frac{2}{3} \\ 4 & 4 & 0 \\ -4 & 0 & 8 \end{pmatrix} \sim \begin{pmatrix} 1 & \frac{2}{3} & -\frac{2}{3} \\ 0 & \frac{4}{3} & \frac{8}{3} \\ 0 & \frac{8}{3} & \frac{16}{3} \end{pmatrix} \sim$$

$$\sim \begin{pmatrix} 1 & \frac{2}{3} & -\frac{2}{3} \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{pmatrix} \qquad rg(A - \lambda_1 E) = 2.$$

u_1, u_3 - базис; u_2 - св., $u_2 = C_1$

$$\begin{cases} u_1 + \frac{2}{3} C_1 - \frac{2}{3} u_3 = 0 \\ 2u_3 + C_1 = 0 \end{cases} \Rightarrow \begin{cases} u_1 = -C_1 \\ u_3 = -\frac{1}{2} C_1 \end{cases}$$

$$\bar{u} = C_1 \begin{pmatrix} -1 \\ 1 \\ -\frac{1}{2} \end{pmatrix}, \text{ пусть } \bar{a}_1 = \begin{pmatrix} -1 \\ 1 \\ -\frac{1}{2} \end{pmatrix}; \ |\bar{a}_1| = \frac{3}{2}$$

$$C_1 = \frac{2}{3}$$

$$\bar{u} = \frac{2}{3} \begin{pmatrix} -1 \\ 1 \\ -\frac{1}{2} \end{pmatrix}$$

2) $\lambda_2 = 5$

$$\begin{pmatrix} 0 & 4 & -4 \\ 4 & -2 & 0 \\ -4 & 0 & 2 \end{pmatrix} \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 4 & -4 \\ 4 & -2 & 0 \\ -4 & 0 & 2 \end{pmatrix} \sim \begin{pmatrix} 1 & -\frac{1}{2} & 0 \\ 0 & 4 & -4 \\ -4 & 0 & 2 \end{pmatrix} \sim \begin{pmatrix} 1 & -\frac{1}{2} & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{pmatrix}$$

$rg(A - \lambda_2 E) = 2$

v_1, v_3 – баз, v_2 – св., $v_2 = c_2$

$$\begin{cases} v_1 - \frac{1}{2} v_2 = 0 \\ c_2 - v_3 = 0 \end{cases} \quad \begin{cases} v_1 = \frac{1}{2} c_2 \\ c_2 = v_3 \end{cases}$$

$\bar{v} = c_2 \begin{pmatrix} \frac{1}{2} \\ 2 \\ 1 \end{pmatrix}$, пусть $\bar{a}_2 = \begin{pmatrix} \frac{1}{2} \\ 1 \\ 1 \end{pmatrix}$, $|\bar{a}| = \frac{3}{2}$; $c_2 = \frac{2}{3}$

$$\bar{v} = \frac{2}{3} \begin{pmatrix} \frac{1}{2} \\ 1 \\ 1 \end{pmatrix}$$

3) $\lambda_3 = 11$

$\begin{pmatrix} -6 & 4 & -4 \\ -4 & -8 & 0 \\ -4 & 0 & - \end{pmatrix}$

$\begin{pmatrix} -6 & 4 & -4 \\ 4 & -8 & 0 \\ -4 & 0 & -4 \end{pmatrix}$

$rg(A - \lambda_3$

w_1, w_2 – ба

$\begin{cases} w_1 - \frac{2}{3} w_2 \\ w_2 + \frac{1}{2} c_3 \end{cases}$

$\begin{cases} w_1 = -\frac{2}{6} c \\ w_2 = -\frac{1}{2} c \end{cases}$

$\bar{w} = \begin{pmatrix} -1 \\ -\frac{1}{2} \\ -1 \end{pmatrix} c$

$\bar{w} = \frac{2}{3} ($

3) $\lambda_3 = 11$

$$\begin{pmatrix} -6 & 4 & -4 \\ -4 & -8 & 0 \\ -4 & 0 & -4 \end{pmatrix} \begin{pmatrix} w_1 \\ w_2 \\ w_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} -6 & 4 & -4 \\ 4 & -8 & 0 \\ -4 & 0 & -4 \end{pmatrix} \sim \begin{pmatrix} 1 & -\frac{2}{3} & \frac{2}{3} \\ 0 & -\frac{16}{3} & -\frac{8}{3} \\ 0 & -\frac{8}{3} & -4 \end{pmatrix} \sim \begin{pmatrix} 1 & -\frac{2}{3} & \frac{2}{3} \\ 0 & 1 & \frac{1}{2} \\ 0 & 0 & 0 \end{pmatrix}$$

$rg(A - \lambda_3 E) = 2$

w_1, w_2 – базис, w_3 – св. $w_3 = c_3$

$$\begin{cases} w_1 - \frac{2}{3} w_2 + \frac{2}{3} c_3 = 0 \\ w_2 + \frac{1}{2} c_3 = 0 \end{cases}$$

$$\begin{cases} w_1 = -\frac{2}{6} c_3 - \frac{2}{3} c_3 ; \\ w_2 = -\frac{1}{2} c_3 \end{cases} \Rightarrow \begin{cases} w_1 = -c_3 \\ w_2 = -\frac{1}{2} c_3 \end{cases}$$

$\overline{w} = \begin{pmatrix} -1 \\ -\frac{1}{2} \\ -1 \end{pmatrix} c_3$, пусть $\overline{a}_3 = \begin{pmatrix} -1 \\ -\frac{1}{2} \\ -1 \end{pmatrix}$, $|\overline{a}_3| = \frac{3}{2}$

$c_3 = \frac{2}{3}$

$\overline{w} = \frac{2}{3} \begin{pmatrix} -1 \\ -\frac{1}{2} \\ -1 \end{pmatrix}$

$\begin{matrix} -\frac{1}{2} & 0 \\ 1 & 1 \\ 0 & 0 \end{matrix}$

$\ldots = \frac{3}{2}; c_2 = \frac{2}{3}$

Матрица перехода

$$T = \begin{pmatrix} -\frac{2}{3} & \frac{1}{3} & -\frac{2}{3} \\ \frac{2}{3} & \frac{2}{3} & -\frac{1}{3} \\ -\frac{1}{3} & \frac{2}{3} & \frac{2}{3} \end{pmatrix} \quad \det T = -1$$

Замена переменных:

$$\begin{cases} x = -\frac{2}{3}x_1 + \frac{1}{3}y_1 - \frac{2}{3}z_1 \\ y = \frac{2}{3}x_1 + \frac{2}{3}y_1 - \frac{1}{3}z_1 \\ z = -\frac{1}{3}x_1 + \frac{2}{3}y_1 + \frac{2}{3}z_1 \end{cases}$$

$$-x_1^2 + 5y_1^2 + 11z_1^2 - 10x - 20y - 20z + 45 = 0$$

$$-x_1^2 + 5y_1^2 + 11z_1^2 - 30y + 45 = 0$$

$$-x_1^2 + 5(y_1^2 - 6y + 9) + 11z_1^2 = 0$$

$$-x_1^2 + 5(y_1 - 3)^2 + 11z_1^2 = 0$$

$$-\frac{x_1^2}{11} + \frac{5(y_1-3)^2}{11} + z_1^2 = 0$$

$$\begin{cases} x_1 = x_2 \\ y_1 - 3 = y_2 \\ z_1 = z_2 \end{cases} \quad \frac{-x_2^2}{11} + \frac{5y_2^2}{11} + z_2^2 = 0$$

— конус 2-го порядка