№3 (1533) $A = \begin{pmatrix} 6 & 6 & -15 \\ 1 & 5 & -5 \\ 1 & 2 & -2 \end{pmatrix}$

$A - \lambda E = \begin{pmatrix} 6-\lambda & 6 & -15 \\ 1 & 5-\lambda & -5 \\ 1 & 2 & -2-\lambda \end{pmatrix} = (3-\lambda)^3$

$\lambda = 3$, кр. 3

$B = A - 3E = \begin{pmatrix} 3 & 6 & -15 \\ 1 & 2 & -5 \\ 1 & 2 & -5 \end{pmatrix} \sim (3, 6, -15) \sim (1\ 2\ -5)$ $x_2, x_3 - б.з.$

| $x_2$ | $x_1$ | $x_3$ |
|---|---|---|
| 2 | -1 | 0 |
| 5 | 0 | -1 |

$a_1 = (2, -1, 0)$, $a_2 (5, 0, 1)$ $h = 2$

$B^2 = \begin{pmatrix} 3 & 6 & -15 \\ 1 & 2 & -5 \\ 1 & 2 & -5 \end{pmatrix} \begin{pmatrix} 3 & 6 & -15 \\ 1 & 2 & -5 \\ 1 & 2 & -5 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

| $x_2$ | $x_1$ | $x_3$ |
|---|---|---|
| 1 | 0 | 0 |

$a_3 = (1, 0, 0)$ $h = 3$

$a_3$, $\varphi(a_3) = (3, 1, 1)$

$f_3 = (3, 1, 1)$
$f_2 = (1, 0, 0)$
$f_1 = (3, 0, 1)$

$A_J = \begin{pmatrix} 3 & 1 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 3 \end{pmatrix}$

(1534) $A = \begin{pmatrix} 0 & 1 & -1 & 1 \\ -1 & 2 & -1 & 1 \\ -1 & 1 & 1 & 0 \\ -1 & 1 & 0 & 1 \end{pmatrix}$

$A - \lambda E = \begin{pmatrix} 0-\lambda & 1 & -1 & 1 \\ -1 & 2-\lambda & -1 & 1 \\ -1 & 1 & 1-\lambda & 0 \\ -1 & 1 & 0 & 1-\lambda \end{pmatrix} = (1-\lambda)^4$

$(1-\lambda)^4 = 0$
$\lambda = 1$ кр. 4

$B_1$ $A-E = \begin{pmatrix} -1 & 1 & -1 & 1 \\ -1 & 1 & -1 & 1 \\ -1 & 1 & 0 & 0 \\ -1 & 1 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} -1 & 1 & -1 & 1 \\ -1 & 1 & 0 & 0 \end{pmatrix} \sim \begin{pmatrix} -1 & 1 & -1 & 1 \\ 0 & 0 & 1 & -1 \end{pmatrix}$

$x_1, x_4$ – б.з.

| $x_1$ | $x_2$ | $x_3$ | $x_4$ |
|---|---|---|---|
| 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 |

$a_1 = (1,1,0,0)$, $a_2 = (0,0,1,1)$ $h=1$

$B^2 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$ $q_3 = (-1,0,0,0)$ $h=1$

$q_4 = (0,0,-1,0)$ $h=1$

$f_1 = \varphi(a_1) = (1,1,1,1)$ } $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

$f_2 = q_3 = (-1,0,0,0)$ }

$f_3 = \varphi(a_2) = (1,1,0,0)$ } $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

$f_4 = a_2 = (0,0,-1,0)$ }

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

(1090) $A = \begin{pmatrix} 0 & 1 & 0 \\ -4 & 4 & 0 \\ -2 & -1 & 2 \end{pmatrix}$ $A-\lambda E = \begin{pmatrix} 0-\lambda & 1 & 0 \\ -4 & 4-\lambda & 0 \\ -2 & -1 & 2-\lambda \end{pmatrix} \cdot (2-\lambda)^3$

$\lambda = 2$, $k_p = 3$

$B_2 = A-2E = \begin{pmatrix} -2 & 1 & 0 \\ -4 & 2 & 0 \\ -2 & -1 & 0 \end{pmatrix} \sim \begin{pmatrix} -2 & 1 & 0 \\ 0 & -2 & 0 \end{pmatrix}$

| $x_3$ | $x_2$ | $x_1$ |
|---|---|---|
| 0 | 0 | 1 |

$q_1 = (0,0,1)$ $h=1$

$B^2 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 8 & -4 & 0 \end{pmatrix} \sim \begin{pmatrix} 8 & -4 & 0 \end{pmatrix}$

| $x_3$ | $x_2$ | $x_1$ |
|---|---|---|
| $\frac{1}{2}$ | 1 | 0 |
| 0 | 0 | 1 |

$q_2 = \left(\frac{1}{2}, 1, 0\right) = (1,2,0)$ $h=2$

$B^3 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

| $x_3$ | $x_2$ | $x_1$ |
|---|---|---|
| 0 | 1 | 0 |

$a_3 = (0,1,0)$ $h=3$

$f_1 = \psi^2(a_1) = (0,0,-4)$

$f_2 = \psi(a_1) = (1,2,-1)$

$f_3 = a_1 = 0,1,0$

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

(1096) $A = \begin{pmatrix} 4 & -5 & 2 \\ 5 & -7 & 3 \\ 6 & -9 & 4 \end{pmatrix}$

$A - \lambda E = \begin{pmatrix} 4-\lambda & -5 & 2 \\ 5 & -7-\lambda & 3 \\ 6 & -9 & 4-\lambda \end{pmatrix} = \lambda - \lambda^2 = \lambda^2(1-\lambda) = 0$

$\lambda_1 = 0$ кр. 2

$\lambda_2 = 1$ кр. 1

$B_1 = A - \lambda_1 E = \begin{pmatrix} 4 & -5 & 2 \\ 5 & -7 & 3 \\ 6 & -9 & 4 \end{pmatrix} \sim \begin{pmatrix} 4 & -5 & 2 \\ 0 & -3 & 2 \end{pmatrix}$ $x_1 - 6.3$

| $x_2$ | $x_1$ | $x_3$ |
|---|---|---|
| 1 | 2 | 3 |

$a_1 = (1,4,8)$ $h=1$

$B_2 = A - \lambda_2 E = \begin{pmatrix} 3 & -5 & 2 \\ 5 & -8 & 3 \\ 6 & -9 & 3 \end{pmatrix} \sim \begin{pmatrix} 3 & -5 & 2 \\ 0 & 1 & -1 \end{pmatrix}$ $x_1 - 6.1$

| $x_2$ | $x_1$ | $x_3$ |
|---|---|---|
| 1 | 1 | 1 |

$a_2 = (1,1,1)$ $h=1$

$B_2 = \begin{pmatrix} 4 & -5 & 2 \\ 5 & -7 & 3 \\ 6 & -9 & 4 \end{pmatrix} \begin{pmatrix} 4 & -5 & 2 \\ 5 & -7 & 3 \\ 6 & -9 & 4 \end{pmatrix} = (3 \; -3 \; 1)$ $x_1, x_1 - 6.3.$

| $x_2$ | $x_1$ | $x_3$ |
|---|---|---|
| 1 | 1 | 0 |

$a_2 = (1,1,0)$ $h=2$

$a_1, \psi(a_1) = (-1,-1,-3)$

$f_1 = \psi(a_1) = (-1, -2, -5)$ $\left\{ \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} \right.$

$f_2 = a_1 = (1, 1, 0)$

$f_3 = a_2 = (1, 1, 1)$

$$A_f = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

(ПОР)
$$\begin{pmatrix} 3 & -4 & 0 & 2 \\ 4 & -5 & -2 & 4 \\ 0 & 0 & 3 & -2 \\ 0 & 0 & 2 & -1 \end{pmatrix} \quad A - \lambda E = \begin{pmatrix} 3-\lambda & -4 & 0 & 2 \\ 4 & -5-\lambda & -2 & 4 \\ 0 & 0 & 3-\lambda & -2 \\ 0 & 0 & 2 & -1-\lambda \end{pmatrix} = (\lambda-1)^2(\lambda+1)^2$$

$(\lambda-1)^2(\lambda+1)^2 = 0$

$\lambda_1 = 1$ кр.2

$\lambda_2 = -1$ кр = 2

$$B_1 = \begin{pmatrix} 2 & -4 & 0 & 2 \\ 4 & -6 & -2 & 4 \\ 0 & 0 & 2 & -2 \\ 0 & 0 & 2 & -2 \end{pmatrix} \sim \begin{pmatrix} 2 & -4 & 0 & 2 \\ 4 & -6 & -2 & 4 \end{pmatrix} \sim \begin{pmatrix} 2 & -4 & 0 & 2 \\ 0 & 2 & -2 & 0 \end{pmatrix}$$

$x_2, x_4 - b_3$.

| $x_1$ | $x_2$ | $x_3$ | $x_4$ |
|---|---|---|---|
| 2 | 1 | 1 | 0 |
| -1 | 0 | 0 | 1 |

$\Rightarrow a_1(2, 1, 1, 0)$

$a_1 = (-1, 0, 0, 1)$ $h = 1$

$$B_2 = \begin{pmatrix} 4 & -4 & 0 & 2 \\ 4 & -4 & -2 & 4 \\ 0 & 0 & 4 & -4 \\ 0 & 0 & 2 & 0 \end{pmatrix} \sim \begin{pmatrix} 4 & -4 & 0 & 2 \\ 0 & 0 & -2 & 2 \\ 0 & 0 & 0 & 2 \end{pmatrix} \quad x_2 - b_3.$$

| $x_1$ | $x_2$ | $x_3$ | $x_4$ |
|---|---|---|---|
| 1 | 1 | 0 | 0 |

$a_3 = (1, 1, 0, 0)$, $h = 1$

$$B_2 = \begin{pmatrix} 0 & 0 & 12 & -8 \\ 0 & 0 & 8 & -4 \\ 0 & 0 & 12 & -8 \\ 0 & 0 & 8 & -4 \end{pmatrix} \sim \begin{pmatrix} 0 & 0 & 3 & -2 \\ 0 & 0 & 2 & -1 \end{pmatrix} \sim \begin{pmatrix} 0 & 0 & 3 & -2 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$x_4, x_4 - b.y.$

| $x_3$ | $x_1$ | $x_3$ | $x_4$ |
|---|---|---|---|
| 1 | 0 | 0 | 0 |

$a_1 = (1, 0, 0, 0) \quad h = 2$

$a_1, \quad \psi_2(a_1) = (1, 1, 0, 0)$

$f_1 = \psi_2(a_1) = 1, 1, 0, 0$

$f_2 = a_1 = (1, 0, 0, 0)$

$f_3 = a_3 = (2, 1, 1, 0)$

$f_4 = a_4 = (1, 1, 0, 0)$

$$A_f = \begin{pmatrix} -1 & 1 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$$