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$$\ddot{y} - 2\dot{y} - 4y = u \quad ; \quad u = -\psi \cdot y$$

$$\psi = \begin{cases} 2, & y \cdot s > 0 \\ -2, & y \cdot s \leq 0 \end{cases} \quad ; \quad s = \dot{y} + 3y$$

Замена:

$$x_1 = y$$

$$x_2 = \dot{x}_1 = \dot{y}$$

$$\begin{cases} \dot{x}_1 = x_2 \end{cases}$$

$$\begin{cases} \dot{x}_2 = \ddot{x}_1 = \ddot{y} = u + 2\dot{y} + 4y = -\psi \cdot x_1 + 2x_2 + 4x_1 = \end{cases}$$

$$= \begin{cases} 2x_1 + 2x_2, & x_1(x_2 + 3x_1) > 0 \\ -2x_1 + 2x_2, & x_1(x_2 + 3x_1) \leq 0 \end{cases}$$

1) $x_1(x_2 + 3x_1) > 0$

$$\begin{cases} \dot{x}_1 = x_2 \end{cases}$$

$$\begin{cases} 2x_1 + 2x_2 = \dot{x}_2 \end{cases}$$

$$A = \begin{pmatrix} 0 & 1 \\ 2 & 2 \end{pmatrix} \quad \det(A - \lambda I) = \begin{vmatrix} -\lambda & 1 \\ 2 & 2-\lambda \end{vmatrix} = -\lambda(2-\lambda) - 2 =$$

$$= \lambda^2 - 2\lambda - 2$$

$$\lambda_{1,2} = 1 \pm \sqrt{3} \quad - \text{целое}$$

2)

$$2) \quad x_1(x_2 + 3x_1) \leq 0$$

$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = -2x_1 + 2x_2 \end{cases}$$

$$A = \begin{pmatrix} 0 & 1 \\ -2 & 2 \end{pmatrix} \quad \det(A - \lambda I) = \begin{vmatrix} -\lambda & 1 \\ -2 & 2-\lambda \end{vmatrix} = -\lambda(2-\lambda) + 2 =$$

$$= \lambda^2 - 2\lambda + 2$$

$$\lambda_{1,2} = 1 \pm i - \text{чист. фазы.}$$