① Compute determinant and set it to zero:

For

$$A = \begin{pmatrix} 3 & K & -1 \\ -3 & 2 & 1 \\ 1 & 0 & 1 \end{pmatrix},$$

the determinant is:

$$\det(A) = 3\det\begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix} - K\det\begin{pmatrix} -3 & 1 \\ 1 & 1 \end{pmatrix} + (-1)\det\begin{pmatrix} -3 & 2 \\ 1 & 0 \end{pmatrix}$$

$$= 3(2\cdot 1 - 1\cdot 0) - K(-3\cdot 1 - 1\cdot 1) - 1(-3\cdot 0 - 2\cdot 1)$$

$$= 3(2) \quad - K(-3-1) - 1(-2)$$

$$= \quad 6 \quad - (-4K) \quad + 2$$

$$= \quad 6 \quad + 4K \quad + 2$$

$$= \quad 4K + 8$$

② Solve for invertibility:

A matrix is NOT invertible exactly when its determinant is zero. Thus, set:

$$4K + 8 = 0$$

$$-8 \quad -8$$

$$4K = -8$$

$$\boxed{K = -2}$$