① $\begin{bmatrix} 1 & 1 & 1 & 1 & \vdots & 3 \\ 1 & -1 & 1 & -1 & \vdots & 3 \\ 2 & 0 & 2 & 0 & \vdots & 6 \end{bmatrix}$

② $\begin{bmatrix} 1 & 1 & 1 & 1 & \vdots & 3 \\ 1 & -1 & 1 & -1 & \vdots & 3 \\ 2 & 0 & 2 & 0 & \vdots & 6 \end{bmatrix} \xrightarrow[R_3 \leftarrow R_3 - 2R_1]{R_2 \leftarrow R_2 - R_1} \begin{bmatrix} 1 & 1 & 1 & 1 & \vdots & 3 \\ 0 & -2 & 0 & -2 & \vdots & 0 \\ 0 & -2 & 0 & -2 & \vdots & 0 \end{bmatrix}$

$\xrightarrow{R_3 \leftarrow R_3 - R_2} \begin{bmatrix} 1 & 1 & 1 & 1 & \vdots & 3 \\ 0 & -2 & 0 & -2 & \vdots & 0 \\ 0 & 0 & 0 & 0 & \vdots & 0 \end{bmatrix} \xrightarrow{R_2 \leftarrow R_2/(-2)} \begin{bmatrix} 1 & 1 & 1 & 1 & \vdots & 3 \\ 0 & 1 & 0 & 1 & \vdots & 0 \\ 0 & 0 & 0 & 0 & \vdots & 0 \end{bmatrix}$

$\xrightarrow{R_1 \leftarrow R_1 - R_2} \begin{bmatrix} 1 & 0 & 1 & 0 & \vdots & 3 \\ 0 & 1 & 0 & 1 & \vdots & 0 \\ 0 & 0 & 0 & 0 & \vdots & 0 \end{bmatrix}$

③ The rank is 2, since there are only two linearly independent rows.

④ Translating x_3 and x_4 to the right sides of the equations, we obtain

$$\begin{aligned} x_1 &= 3 - x_3 \\ x_2 &= \qquad\quad -x_4 \\ x_3 &= x_3 \\ x_4 &= x_4 \end{aligned} \quad \text{, i.e.} \quad \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \\ 0 \\ 0 \end{bmatrix} + x_3 \begin{bmatrix} -1 \\ 0 \\ 1 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} 0 \\ -1 \\ 0 \\ 1 \end{bmatrix}$$

⑤ The solution represents a plane in 4-dimensional space.

⑥ $A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & -1 \\ 2 & 0 & 2 & 0 \end{bmatrix}$, $b = \begin{bmatrix} 3 \\ 3 \\ 6 \end{bmatrix}$.