① Sum of all rows = 0 ✗

 Zero in 3rd row

 1st row is 1 larger then 3rd row ✓

 1st row = negative 3rd row ✗

② $\left\{\begin{bmatrix}2\\1\\1\end{bmatrix}\begin{bmatrix}1\\-1\\2\end{bmatrix}\begin{bmatrix}2\\3\\-1\end{bmatrix}\right\}$ ✗ $\left\{\begin{bmatrix}1\\-3\\4\end{bmatrix}\begin{bmatrix}0\\-1\\1\end{bmatrix}\begin{bmatrix}3\\2\\1\end{bmatrix}\right\}$ ✗

③ 5

 4 ✗

 3 ✓

 2 ✗

$\begin{bmatrix}x_1\\x_1\\x_3\\x_4\\x_5\end{bmatrix}\begin{bmatrix}y_1\\y_1\\y_3\\y_4\\y_5\end{bmatrix}$

$\mathcal{E}=0$ $\mathcal{E}=0$

④ $\left\{\dfrac{1}{\sqrt{6}}\begin{bmatrix}2\\1\\1\end{bmatrix}, \dfrac{1}{\sqrt{30}}\begin{bmatrix}2\\-5\\1\end{bmatrix}\right\}$ ✗ $\left\{\dfrac{1}{\sqrt{5}}\begin{bmatrix}2\\0\\1\end{bmatrix}\begin{bmatrix}0\\1\\0\end{bmatrix}\right\}$ ✗

⑤ $\left\{\dfrac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}1\\0\end{bmatrix}\right\}$ ✗ $\left\{\dfrac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}, \dfrac{1}{\sqrt{2}}\begin{bmatrix}1\\-1\end{bmatrix}\right\}$ ✗

(6)

$\begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix}$ ✗ $\left[\begin{array}{cccc|c} 1 & -1 & 1 & 1 & 0 \\ 4 & -4 & 3 & 6 & 0 \\ 2 & -2 & 1 & 3 & 0 \end{array}\right] \rightarrow \left[\begin{array}{cccc|c} 1 & -1 & 1 & 1 & 0 \\ 0 & 0 & -1 & 2 & 0 \\ 0 & 0 & -1 & 1 & 0 \end{array}\right] \rightarrow \left[\begin{array}{cccc|c} 1 & -1 & 1 & 1 & 0 \\ 0 & 0 & 1 & -2 & 0 \\ 0 & 0 & 0 & -1 & 0 \end{array}\right]$

$x_4 = 0$
$x_3 = 2x_4 = 0$
$x_2 = x_1$
$x_1 = x_2$

$\begin{bmatrix} 1 \\ -1 \\ 0 \\ 0 \end{bmatrix}$ ✓

(7)

$a \begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix} + \begin{bmatrix} 3 \\ 0 \\ 0 \\ -2 \end{bmatrix}$ ✗ $a \begin{bmatrix} 1 \\ 1 \\ b \\ 0 \end{bmatrix} + \begin{bmatrix} 3 \\ 0 \\ 0 \\ -2 \end{bmatrix}$ ✓

(8)

1
2 ✓
3
4

(9) $\dfrac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ ✗ $\begin{bmatrix} 4 \\ 2 \\ -4 \end{bmatrix}$ ✓

(10) $y = x$ ✗ $y = \dfrac{1}{2} + \dfrac{1}{2}x$ ✓