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$$2x_1 + x_2 + x_3 = 0$$
$$-6x_1 + 3x_2 + 9x_3 = 6$$
$$2x_1 + 2x_2 + 3x_3 = 1$$

I	2	1	1	0	
II	-6	3	9	6	(+3 I)
III	2	2	3	1	(-I)
	2	1	1	0	
	0	6	12	6	
	0	1	2	1	$(-\frac{1}{6}$ II)
	2	1	1	0	
	0	6	12	6	
	~~0~~	~~0~~	~~0~~	~~0~~	

$\Rightarrow$ $2x_1 + x_2 + x_3 = 0$, $6x_2 + 12x_3 = 6$, ~~$0 = 0$~~

x_3 beliebig, $x_3 := t \in \mathbb{R}$

$$6x_2 + 12t = 6 \iff x_2 = \frac{6 - 12t}{6} \iff x_2 = 1 - 2t$$

$$2x_1 + \underbrace{1 - 2t + t}_{= 1 - t} = 0 \iff x_1 = \frac{t - 1}{2}$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} \frac{t-1}{2} \\ 1 - 2t \\ t \end{bmatrix} = \begin{bmatrix} -\frac{1}{2} \\ 1 \\ 0 \end{bmatrix} + t \begin{bmatrix} \frac{1}{2} \\ -2 \\ 1 \end{bmatrix}, \quad t \in \mathbb{R}$$