

$$\begin{array}{rcl}
 x + 3y - z & = & 2 \\
 y + 3z & = & -2
 \end{array} \quad \begin{array}{l} | \cdot 3 \\ + \end{array}$$

$$\begin{array}{rcl}
 3x + 10y & = & 4 \\
 3x & = & 4 - 10y
 \end{array}$$

$$\boxed{x = \frac{4}{3} - \frac{10}{3}y}$$

$$\begin{array}{rcl}
 3z & = & -2 - y \\
 z & = & -\frac{2}{3} - \frac{y}{3}
 \end{array}$$

$$\frac{4-10y}{3} + 3y + \frac{2+y}{3} = 2$$

$$0 = 0$$

$$t \in \mathbb{R}$$

$$\begin{aligned}
 x &= \frac{4}{3} - \frac{10}{3}t \\
 y &= t \\
 z &= -\frac{2}{3} - \frac{t}{3}
 \end{aligned}$$

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$$\begin{array}{rcl}
 x + y + z & = & 1 \\
 x + 2y + 2z & = & 2 \\
 2x + 2y + z & = & 3
 \end{array} \quad \begin{array}{l} | \cdot (-2) \\ \uparrow \\ + \end{array}$$

$$\begin{array}{rcl}
 x + y + z & = & 1 \\
 \boxed{0} - y - z & = & -1 \\
 \boxed{0} \quad \boxed{0} + z & = & -1
 \end{array} \quad \begin{array}{l} \uparrow + \\ \uparrow + \end{array}$$

$$\begin{array}{rcl}
 x + y & = & 2 \\
 + y & = & 2 \\
 z & = & -1
 \end{array} \quad \begin{array}{l} \uparrow + \\ \uparrow + \end{array}$$

$$\begin{array}{rcl}
 x & = & 0 \\
 y & = & 2 \\
 z & = & -1
 \end{array}$$

$$\underline{\underline{K = [0 \ 2 \ -1]}}$$

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$\begin{array}{rcl} x - y + z & = & 2 \quad (-1) \\ x + 2y - 2z & = & 3 \\ \hline 6x - 3y + 3z & = & 14 \end{array}$ $\begin{array}{l} (-1) \\ + \\ + \end{array}$ $\begin{array}{rcl} x - y + z & = & 2 \\ 3y - 3z & = & 1 \quad (-1) \\ 3y - 3z & = & 2 \quad (-1) \\ \hline \end{array}$ $\begin{array}{rcl} x - y + z & = & 2 \\ 3y - 3z & = & 1 \\ \boxed{0 = 1} \end{array}$	$\begin{array}{ccc c} 1 & -1 & 1 & 2 \\ 1 & 2 & -2 & 3 \\ \hline 6 & -3 & 3 & 14 \end{array}$ $\begin{array}{l} (-1) \\ (-1) \\ + \end{array}$ $\begin{array}{ccc c} 1 & -1 & 1 & 2 \\ 0 & 3 & -3 & 1 \quad (-1) \\ 0 & 3 & -3 & 2 \end{array}$ $\begin{array}{ccc c} 1 & -1 & 1 & 2 \\ 0 & 3 & -3 & 1 \\ 0 & 0 & \boxed{0} & \boxed{1} \end{array}$
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$\left(\begin{array}{ccc|c} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{array} \right) \downarrow$
 $\left(\begin{array}{ccc|c} 1 & \cdot & \cdot & x \\ \cdot & 1 & \cdot & y \\ \cdot & \cdot & 1 & z \end{array} \right) \uparrow$

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$$\begin{array}{rcl}
 x + y - 2z + u & = & -5 \\
 2x + 2y - z - u & = & 2 \\
 3x + y + z + u & = & 8 \\
 x - y + z - u & = & 6
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & -2 & 1 & -5 \\
 2 & 2 & -1 & -1 & 2 \\
 3 & 1 & 1 & 1 & 8 \\
 1 & -1 & 1 & -1 & 6
 \end{array}
 \begin{array}{l}
 (2) - (1) \\
 (3) - (1) \\
 (4) - (1)
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & -2 & 1 & -5 \\
 0 & 0 & 7 & -2 & 4 \\
 0 & -2 & 3 & 0 & 13 \\
 0 & -2 & 3 & -2 & 11
 \end{array}
 \begin{array}{l}
 (-1) \cdot 1
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & -2 & 1 & -5 \\
 0 & -2 & 3 & -2 & 11 \\
 0 & 0 & 7 & -2 & 4 \\
 0 & 0 & 1 & 0 & 3
 \end{array}
 \begin{array}{l}
 (-1) \cdot 1
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & -2 & 1 & -5 \\
 0 & -2 & 3 & -2 & 11 \\
 0 & 0 & 7 & -2 & 4 \\
 0 & 0 & 0 & 1 & -1
 \end{array}$$

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$$\begin{array}{cccc|c}
 1 & 1 & -2 & 1 & -5 \\
 0 & -2 & 3 & -2 & 11 \\
 0 & 0 & 7 & -2 & 4 \\
 0 & 0 & 0 & 1 & -1
 \end{array}
 \begin{array}{l}
 (2) \cdot (-1) \\
 (3) \cdot (-1)
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & -2 & 0 & -4 \\
 0 & -2 & 3 & 0 & 9 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & -1
 \end{array}
 \begin{array}{l}
 (2) \cdot (-1) \\
 (1) + (2)
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 0 & 0 & 0 & 2 \\
 0 & -2 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & -1
 \end{array}
 \begin{array}{l}
 (2) \cdot (-1)
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 0 & 0 & 0 & 2 \\
 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & -1
 \end{array}$$

$$\begin{array}{l}
 x = 2 \\
 y = 0 \\
 z = 3 \\
 u = -1
 \end{array}$$

$$K = [x; y; z; u] \\
 K = [2; 0; 3; -1]$$

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$$\begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 1 & 2 & 2 & 2 \\ 2 & 2 & 1 & 3 \end{array} \quad \begin{array}{l} \begin{pmatrix} 1 & 1 \\ & -1 \end{pmatrix} \begin{pmatrix} 1 & -2 \end{pmatrix} \\ + \end{array}$$

$$\begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & +1 & -1 \end{array} \quad \begin{array}{l} \nearrow \\ \nearrow \\ (-1) \quad (-1) \end{array}$$

$$\begin{array}{ccc|c} 1 & 1 & 0 & 2 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -1 \end{array} \quad (-1)^+$$

$$\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -1 \end{array}$$

$$\begin{aligned} [b\bar{r}_i, f\bar{n}_i, iks] &= \\ &= [0, 2i-1] \end{aligned}$$

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$$\begin{array}{ccc|ccc} & a & b & c & & \\ 1 & -1 & 1 & 2 & (-1) & (-6) \\ 1 & 2 & -2 & 3 & \swarrow + & \\ 6 & -3 & 3 & 14 & & \swarrow \end{array}$$

$$\begin{array}{ccc|c} 1 & -1 & 1 & 2 \\ 0 & 3 & -3 & 1 \quad (-1) \\ 0 & 3 & -3 & 2 \quad \downarrow \end{array} \quad \text{NR}$$

$$\begin{array}{ccc|c} 1 & -1 & 1 & 2 \\ 0 & 3 & -3 & 1 \\ 0 & 0 & 0 & 1 \end{array}$$

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$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 8 \\
 1 & -2 & -1 & 2 & 4 \\
 2 & 1 & 1 & 3 & 17 \\
 3 & 2 & -1 & 1 & 10
 \end{array}
 \begin{array}{l}
 (-1) \quad (-2) \quad (-3) \\
 \swarrow \quad \searrow \quad \swarrow \\
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 8 \\
 0 & -3 & -2 & 1 & -4 \\
 0 & -1 & -1 & 1 & 1 \\
 0 & -1 & -4 & -2 & -14
 \end{array}
 \begin{array}{l}
 (-3) \\
 \swarrow \quad \searrow \\
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 8 \\
 0 & 3 & 2 & -1 & 4 \\
 0 & 0 & 1 & -2 & -7 \\
 0 & 0 & 1 & 1 & 5
 \end{array}
 \begin{array}{l}
)- \\
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 8 \\
 0 & 3 & 2 & -1 & 4 \\
 0 & 0 & 1 & -2 & -7 \\
 0 & 0 & 0 & 1 & 4
 \end{array}$$

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$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 8 \\
 0 & 3 & 2 & -1 & 4 \\
 0 & 0 & 1 & -2 & -7 \\
 0 & 0 & 0 & 1 & 4
 \end{array}
 \begin{array}{l}
 (2) \quad + \quad + \\
 \swarrow \quad \searrow \quad \swarrow \\
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 0 & 4 \\
 0 & 3 & 2 & 0 & 8 \\
 0 & 0 & 1 & 0 & 1 \\
 0 & 0 & 0 & 1 & 4
 \end{array}
 \begin{array}{l}
 (-2) \\
 \swarrow \quad \searrow \\
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 0 & 0 & 3 \\
 0 & 2 & 0 & 0 & 2 \\
 0 & 0 & 1 & 0 & 1 \\
 0 & 0 & 0 & 1 & 4
 \end{array}
 \begin{array}{l}
)- \\
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 0 & 0 & 0 & 1 \\
 0 & 1 & 0 & 0 & 2 \\
 0 & 0 & 1 & 0 & 1 \\
 0 & 0 & 0 & 1 & 4
 \end{array}$$

$$K = [a, b, c, d] = \underline{\underline{[1; 2; 1; 4]}}$$

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$$\begin{array}{ccc|c}
 1 & 2 & -3 & 0 \\
 3 & -3 & 4 & 4 \\
 2 & -1 & -3 & -2
 \end{array}
 \quad \begin{array}{l}
 (-3) \rightarrow + \\
 (-2) \rightarrow +
 \end{array}$$

$$\begin{array}{ccc|c}
 1 & 2 & -3 & 0 \\
 0 & -9 & 13 & 4 \\
 0 & -5 & +3 & -2
 \end{array}
 \quad \begin{array}{l}
 (-5) \\
 (9) \rightarrow +
 \end{array}$$

$$\begin{array}{ccc|c}
 1 & 2 & -3 & 0 \\
 0 & -9 & 13 & 4 \\
 0 & 0 & -38 & -38
 \end{array}
 \quad \begin{array}{l}
 (-13) \rightarrow + \\
 (3) \rightarrow +
 \end{array}$$

$$\begin{array}{ccc|c}
 1 & 2 & 0 & 3 \\
 0 & -9 & 10 & -9 \\
 0 & 0 & 1 & 1
 \end{array}
 \quad \begin{array}{l}
 (-2) \rightarrow +
 \end{array}$$

$$\begin{array}{ccc|c}
 1 & 0 & 0 & 1 \\
 0 & 1 & 0 & 1 \\
 0 & 0 & 1 & 1
 \end{array}
 \quad \begin{array}{l}
 R = [a, b, c] \\
 = [1, 1, 1]
 \end{array}$$

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$$\begin{array}{cccc|c}
 1 & 1 & 1 & -1 & 2 \\
 1 & -1 & -1 & 1 & 0 \\
 1 & 1 & -1 & -2 & 1 \\
 1 & 2 & -1 & 1 & -3
 \end{array}
 \quad \begin{array}{l}
 (K_1) \rightarrow + \\
 (K_2) \rightarrow + \\
 (K_3) \rightarrow +
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & -1 & 2 \\
 0 & -2 & -2 & 2 & -2 \\
 0 & 0 & -2 & -1 & -1 \\
 0 & 1 & -2 & 2 & -5
 \end{array}
 \quad \begin{array}{l}
 (K_2) \rightarrow + \\
 (K_3) \rightarrow +
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & -1 & 2 \\
 0 & -1 & -1 & 1 & -1 \\
 0 & 0 & -2 & -1 & -1 \\
 0 & 0 & -3 & 1 & -6
 \end{array}
 \quad \begin{array}{l}
 (K_2) \rightarrow + \\
 (K_3) \rightarrow +
 \end{array}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & -1 & 2 \\
 0 & -1 & -1 & 1 & -1 \\
 0 & 0 & -2 & -1 & -1 \\
 0 & 0 & 0 & -3 & -1
 \end{array}$$

$$\begin{array}{cccc|c}
 0 & 0 & 0 & 1 & -1
 \end{array}$$

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$$\begin{array}{cccc|c}
 1 & 1 & 1 & -1 & 2 \\
 0 & -1 & -1 & 1 & -1 \\
 0 & 0 & -2 & -1 & -1 \\
 0 & 0 & 0 & -3 & -1
 \end{array} \xrightarrow{\substack{R_2 \leftrightarrow R_1 \\ R_3 \cdot (-1) \\ R_4 \cdot (-1)}}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 0 & 1 \\
 0 & -1 & -1 & 0 & 0 \\
 0 & 0 & -2 & 0 & -2 \\
 0 & 0 & 0 & 1 & -1
 \end{array} \xrightarrow{\substack{R_1 \cdot (-1) \\ R_2 \cdot (-1) \\ R_3 \cdot (-1)}}$$

$$\begin{array}{cccc|c}
 1 & 0 & 0 & 0 & 0 \\
 0 & -1 & 0 & 0 & 1 \\
 0 & 0 & 1 & 0 & 1 \\
 0 & 0 & 0 & 1 & -1
 \end{array} \xrightarrow{R_2 \cdot (-1)}$$

$$\begin{array}{cccc|c}
 1 & 0 & 0 & 0 & 1 \\
 0 & 1 & 0 & 0 & -1 \\
 0 & 0 & 1 & 0 & 1 \\
 0 & 0 & 0 & 1 & -1
 \end{array}$$

$$K = [a_i, b_i, c_i, d] = [1, -1, 1, -1]$$

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$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 10 \\
 1 & 1 & -1 & -1 & -4 \\
 1 & -1 & -1 & 1 & 0 \\
 -1 & 1 & 1 & 1 & 8
 \end{array} \xrightarrow{\substack{R_2 \cdot (-1) \\ R_3 \cdot (-1) \\ R_4 \cdot (-1)}}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 10 \\
 0 & 0 & -2 & -2 & -14 \\
 0 & -2 & -2 & 0 & -10 \\
 0 & 2 & 2 & 2 & 18
 \end{array} \xrightarrow{R_3 \cdot (-1)}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 1 & 10 \\
 0 & 1 & 1 & 0 & 5 \\
 0 & 0 & 1 & 1 & 7 \\
 0 & 0 & 0 & 1 & 4
 \end{array} \xrightarrow{\substack{R_1 \cdot (-1) \\ R_2 \cdot (-1) \\ R_3 \cdot (-1)}}$$

$$\begin{array}{cccc|c}
 1 & 1 & 1 & 0 & 6 \\
 0 & 1 & 1 & 0 & 5 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & 4
 \end{array}$$

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$$\begin{array}{cccc|c}
 1 & 1 & 1 & 0 & 6 \\
 0 & 1 & 1 & 0 & 5 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & 4
 \end{array}$$

)-

$$\begin{array}{cccc|c}
 1 & 1 & 0 & 0 & 3 \\
 0 & 1 & 0 & 0 & 2 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & 4
 \end{array}$$

)-

$$\begin{array}{cccc|c}
 1 & 0 & 0 & 0 & 1 \\
 0 & 1 & 0 & 0 & 2 \\
 0 & 0 & 1 & 0 & 3 \\
 0 & 0 & 0 & 1 & 4
 \end{array}$$

$K = [x; y; z; z'] =$
 $[1; 2; 3; 4]$

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$$\begin{array}{l}
 \frac{x+1}{y+1} = 2 \\
 \frac{y+2}{z+1} = 4 \\
 \frac{z+3}{x+1} = \frac{1}{2}
 \end{array}
 \quad x, y, z \neq -1$$

$$\begin{array}{l}
 x+1 = 2y+2 \\
 y+2 = 4z+4 \\
 z+3 = \frac{1}{2}x + \frac{1}{2}
 \end{array}
 \quad \cdot 2$$

$$\begin{array}{l}
 x - 2y + 0z = 1 \\
 0x + y - 4z = 2 \\
 -x + 0y + 2z = -5
 \end{array}$$

$$\begin{array}{ccc|c}
 1 & -2 & 0 & 1 \\
 0 & 1 & -4 & 2 \\
 -1 & 0 & 2 & -5
 \end{array}$$

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$$\begin{array}{ccc|c}
 1 & -2 & 0 & 1 \\
 0 & 1 & -4 & 2 \\
 -1 & 0 & 2 & -5
 \end{array} \begin{array}{l} \nearrow + \\ \\ \end{array}$$

$$\begin{array}{ccc|c}
 1 & -2 & 0 & 1 \\
 0 & 1 & -4 & 2 \\
 0 & 1 & -1 & 2
 \end{array} \begin{array}{l} \\ \searrow - \\ \end{array}$$

$$\begin{array}{ccc|c}
 1 & -2 & 0 & 1 \\
 0 & 1 & -4 & 2 \\
 0 & 0 & 1 & 0
 \end{array} \begin{array}{l} \\ \\ \nearrow + \end{array} \begin{array}{l} \\ \\ (.4) \end{array}$$

$$\begin{array}{ccc|c}
 1 & -2 & 0 & 1 \\
 0 & 1 & 0 & 2 \\
 0 & 0 & 1 & 0
 \end{array} \begin{array}{l} \nearrow + \\ \nearrow + \\ \end{array} \begin{array}{l} \\ 1.2 \\ \end{array}$$

$$\begin{array}{ccc|c}
 1 & 0 & 0 & 5 \\
 0 & 1 & 0 & 2 \\
 0 & 0 & 1 & 0
 \end{array}$$

$$\underline{\underline{K = [5; 2; 0]}}$$

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