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1 次の連立 1 次方程式が解を持つための a, b, c, d の間の条件をもとめ, その条件がみたされるとき, この連立 1 次方程式の解をすべて求めたい.

$$\begin{cases} x + 2y + 4z + w = a \\ -x - y - z - 3w = b \\ -y - 3z + 3w = c \\ -x + y + 5z - 4w = d \end{cases}$$

いま, この連立方程式を行列表示し, その行列を Gauss の消去法のアルゴリズムにしたがって変形すると下のように変形される. (計算は確かめる必要はない.)

$$\left(\begin{array}{cccc|c} 1 & 2 & 4 & 1 & a \\ -1 & -1 & -1 & -3 & b \\ 0 & -1 & -3 & 3 & c \\ -1 & 1 & 5 & -4 & d \end{array} \right) \rightarrow \dots \rightarrow \left(\begin{array}{cccc|c} \textcircled{1} & 2 & 4 & 1 & a \\ 0 & \textcircled{1} & 3 & -2 & a + b \\ 0 & 0 & 0 & \textcircled{1} & a + b + c \\ 0 & 0 & 0 & 0 & -5a - 6b - 3c + d \end{array} \right)$$

a) 上の連立 1 次方程式が解を持つためには a, b, c, d が満たすべき関係式を求めよ.

b) 上の関係式が満たされるとき, さらに基本変形を続けることによって, 解をすべて求めよ.

2 Three homeowners—a carpenter, an electrician, and a plumber—agree to make repairs in their three homes. They agree to work a total of 10 days each according to the following schedule:

	Work Performed by		
	Carpenter	Electrician	Plumber
Days of Work in Home of Carpenter	2	1	6
Days of Work in Home of Electrician	4	5	1
Days of Work in Home of Plumber	4	4	3

For tax purposes, they must report and pay each other a reasonable daily wage, even for the work each does on his or her own home. Their normal daily wages are about \$100, but they agree to adjust their respective daily wages so that each homeowner will come out even—that is, so that the total amount paid out by each is the same as the total amount each receives. How to set their daily wages?

[From “Elementary Linear Algebra — Applications Version” 9th. edition by Howard Anton and Chris Rorres.]

3 次の連立 1 次方程式を解け.

$$\begin{cases} x - y + z = a \\ 3x - 2y + 5z = b \\ -2x + y - 3z = c \end{cases}$$