

Hinweis:

Bitte beachte, dass die Lösungen automatisch generiert sind und das VisualMath System definitiv noch sehr unfertig ist. Weiterhin ist es eine kompakte Version, du kannst auch andere Umformungen machen, lasse dich nicht irritieren, dass VisualMath lieber kleine Zahlen mag, also : 4 rechnet, wenn jede Zahl in der Zeile durch 4 teilbar ist.

Aufgabenbogen Nr. 1

Löse das lineare Gleichungssystem

a)

$$\begin{aligned}3x - 2y + z &= -19 \\ -4x - 4y + 4z &= -16 \\ 5x + 5y + 4z &= -16\end{aligned}$$

b)

$$\begin{aligned}5x - 2y - z &= -21 \\ -3x - 2y - 3z &= -5 \\ -3x + 4y - 5z &= -7\end{aligned}$$

c)

$$\begin{aligned}-2a + 5b - 3c &= -3 \\ -4a + 5b - 2c &= -6 \\ -5a - 5b + 2c &= -30\end{aligned}$$

d)

$$\begin{aligned}-4x - 3y - z &= 3 \\ x - y + 3z &= -5 \\ x - 2y - 2z &= -14\end{aligned}$$

e)

$$\begin{aligned}a - 5b + 4c &= 16 \\ -5a - b + 4c &= -4 \\ -a + b - 4c &= -8\end{aligned}$$

f)

$$\begin{aligned}-5a + 3b + 3c &= -5 \\ 3a + 5b - 2c &= 16 \\ -a + b - 2c &= -8\end{aligned}$$

g)

$$\begin{aligned}4x + 5y - 2z &= 5 \\ 5x + 3y + 3z &= 14 \\ x + y - 4z &= -6\end{aligned}$$

h)

$$\begin{aligned}-4a + 2b - 4c &= -2 \\ -2a - 5b + 2c &= -11 \\ -5a - 5b + 5c &= -20\end{aligned}$$

i)

$$\begin{aligned}4a - b - c &= -5 \\ 5a - b - 3c &= -16 \\ 2a + 4b + c &= -13\end{aligned}$$

j)

$$\begin{aligned}-2x + 2y - 2z &= -4 \\ -5x + 4y - z &= -13 \\ -4x + 2y - z &= -9\end{aligned}$$

k)

$$\begin{aligned}-x + 2y - 4z &= 4 \\ x + 3y + 2z &= 3 \\ 5x - 3y + 5z &= 2\end{aligned}$$

l)

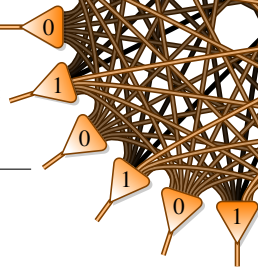
$$\begin{aligned}-x - 2y - 3z &= -23 \\ -x - y + 4z &= 17 \\ -4x + y - 4z &= -7\end{aligned}$$

m)

$$\begin{aligned}5x + y + z &= -7 \\ 2x + 4y + 4z &= 8 \\ -4x + 3y - 2z &= 7\end{aligned}$$

n)

$$\begin{aligned}-x - y + z &= 6 \\ 5x + 3y + 4z &= 4 \\ -2x + 2y - 4z &= -8\end{aligned}$$



o)

$$\begin{aligned} -4x - 4y + z &= -3 \\ 5x + y + 5z &= 39 \\ x - 2y + 5z &= 30 \end{aligned}$$

p)

$$\begin{aligned} -4x + 5y + 3z &= 2 \\ 2x + 3y - 3z &= 12 \\ -x + 5y - 4z &= 28 \end{aligned}$$

q)

$$\begin{aligned} 2x + 4y + 4z &= -18 \\ -3x + 5y + 5z &= -6 \\ -4x - 2y + 5z &= 32 \end{aligned}$$

r)

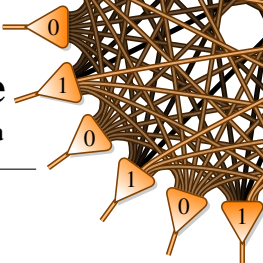
$$\begin{aligned} 3a + 5b - 4c &= -26 \\ -5a - 4b - 3c &= 11 \\ a - b - c &= 0 \end{aligned}$$

s)

$$\begin{aligned} -2x - y + 3z &= 7 \\ -5x - 3y - 4z &= -39 \\ -3x + 2y - 5z &= -44 \end{aligned}$$

t)

$$\begin{aligned} -2a + 4b + 2c &= 10 \\ -4a + b - 4c &= -13 \\ 5a - 4b - 5c &= -31 \end{aligned}$$



Lösungsbogen Nr. 1

a)

$$\left(\begin{array}{ccc|c} 3 & -2 & 1 & -19 \\ -4 & -4 & 4 & -16 \\ 5 & 5 & 4 & -16 \end{array} \right) \cdot \frac{1}{4}$$

$$-27z = 108 \quad | :(-27)$$

$$z = -4$$

$$3x - 6 - 4 = -19$$

$$3x - 10 = -19 \quad | +10$$

$$3x = -9 \quad | :3$$

$$x = -3$$

$$\left(\begin{array}{ccc|c} 3 & -2 & 1 & -19 \\ -1 & -1 & 1 & -4 \\ 5 & 5 & 4 & -16 \end{array} \right) \begin{array}{l} \leftarrow \cdot 5 \\ \leftarrow \cdot 3 \leftarrow + \\ \leftarrow \cdot (-3) \leftarrow + \end{array}$$

$$-5y - 16 = -31 \quad | +16$$

$$-5y = -15 \quad | :(-5)$$

$$y = 3$$

$$\left(\begin{array}{ccc|c} 3 & -2 & 1 & -19 \\ 0 & -5 & 4 & -31 \\ 0 & -25 & -7 & -47 \end{array} \right) \begin{array}{l} \leftarrow \cdot (-5) \\ \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} 3 & -2 & 1 & -19 \\ 0 & -5 & 4 & -31 \\ 0 & 0 & -27 & 108 \end{array} \right)$$

b)

$$\left(\begin{array}{ccc|c} 5 & -2 & -1 & -21 \\ -3 & -2 & -3 & -5 \\ -3 & 4 & -5 & -7 \end{array} \right)$$

$$-350z = -1400 \quad | :(-350)$$

$$z = 4$$

$$5x - 2 - 4 = -21$$

$$5x - 6 = -21 \quad | +6$$

$$5x = -15 \quad | :5$$

$$x = -3$$

$$\left(\begin{array}{ccc|c} 5 & -2 & -1 & -21 \\ -3 & -2 & -3 & -5 \\ -3 & 4 & -5 & -7 \end{array} \right) \begin{array}{l} \leftarrow \cdot 3 \leftarrow \cdot 3 \\ \leftarrow \cdot 5 \leftarrow + \\ \leftarrow \cdot 5 \leftarrow + \end{array}$$

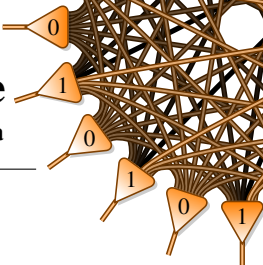
$$-16y - 72 = -88 \quad | +72$$

$$-16y = -16 \quad | :(-16)$$

$$y = 1$$

$$\left(\begin{array}{ccc|c} 5 & -2 & -1 & -21 \\ 0 & -16 & -18 & -88 \\ 0 & 14 & -28 & -98 \end{array} \right) \begin{array}{l} \leftarrow \cdot 7 \\ \leftarrow \cdot 8 \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} 5 & -2 & -1 & -21 \\ 0 & -16 & -18 & -88 \\ 0 & 0 & -350 & -1400 \end{array} \right)$$



c)

$$\left(\begin{array}{ccc|c} -2 & 5 & -3 & -3 \\ -4 & 5 & -2 & -6 \\ -5 & -5 & 2 & -30 \end{array} \right)$$

$$-9c = -45 \quad | :(-9)$$

$$-2a + 20 - 15 = -3$$

$$c = 5$$

$$-2a + 5 = -3 \quad | -5$$

$$-2a = -8 \quad | :(-2)$$

$$a = 4$$

$$\left(\begin{array}{ccc|c} -2 & 5 & -3 & -3 \\ -4 & 5 & -2 & -6 \\ -5 & -5 & 2 & -30 \end{array} \right) \begin{array}{l} | \cdot (-2) \quad | \cdot (-5) \\ \leftarrow + \\ | \cdot 2 \quad \leftarrow + \end{array}$$

$$-5b + 20 = 0 \quad | -20$$

$$-5b = -20 \quad | :(-5)$$

$$b = 4$$

$$\left(\begin{array}{ccc|c} -2 & 5 & -3 & -3 \\ 0 & -5 & 4 & 0 \\ 0 & -35 & 19 & -45 \end{array} \right) \begin{array}{l} | \cdot (-7) \\ \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -2 & 5 & -3 & -3 \\ 0 & -5 & 4 & 0 \\ 0 & 0 & -9 & -45 \end{array} \right)$$

d)

$$\left(\begin{array}{ccc|c} -4 & -3 & -1 & 3 \\ 1 & -1 & 3 & -5 \\ 1 & -2 & -2 & -14 \end{array} \right)$$

$$-184z = -184 \quad | :(-184)$$

$$-4x - 12 - 1 = 3$$

$$z = 1$$

$$-4x - 13 = 3 \quad | +13$$

$$-4x = 16 \quad | :(-4)$$

$$x = -4$$

$$\left(\begin{array}{ccc|c} -4 & -3 & -1 & 3 \\ 1 & -1 & 3 & -5 \\ 1 & -2 & -2 & -14 \end{array} \right) \begin{array}{l} | \cdot 4 \quad \leftarrow + \\ | \cdot 4 \quad \leftarrow + \end{array}$$

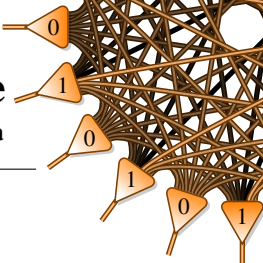
$$-7y + 11 = -17 \quad | -11$$

$$-7y = -28 \quad | :(-7)$$

$$y = 4$$

$$\left(\begin{array}{ccc|c} -4 & -3 & -1 & 3 \\ 0 & -7 & 11 & -17 \\ 0 & -11 & -9 & -53 \end{array} \right) \begin{array}{l} | \cdot (-11) \\ | \cdot 7 \quad \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -4 & -3 & -1 & 3 \\ 0 & -7 & 11 & -17 \\ 0 & 0 & -184 & -184 \end{array} \right)$$



e)

$$\left(\begin{array}{ccc|c} 1 & -5 & 4 & 16 \\ -5 & -1 & 4 & -4 \\ -1 & 1 & -4 & -8 \end{array} \right)$$

$$-48c = -48 \quad | :(-48)$$

$$a + 10 + 4 = 16$$

$$c = 1$$

$$a + 14 = 16 \quad | -14$$

$$a = 2$$

$$\left(\begin{array}{ccc|c} 1 & -5 & 4 & 16 \\ -5 & -1 & 4 & -4 \\ -1 & 1 & -4 & -8 \end{array} \right) \begin{array}{l} | \cdot 5 \rightarrow \\ \leftarrow + \\ \leftarrow + \end{array}$$

$$-26b + 24 = 76 \quad | -24$$

$$-26b = 52 \quad | :(-26)$$

$$b = -2$$

$$\left(\begin{array}{ccc|c} 1 & -5 & 4 & 16 \\ 0 & -26 & 24 & 76 \\ 0 & -4 & 0 & 8 \end{array} \right) \begin{array}{l} | \cdot (-2) \rightarrow \\ | \cdot 13 \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} 1 & -5 & 4 & 16 \\ 0 & -26 & 24 & 76 \\ 0 & 0 & -48 & -48 \end{array} \right)$$

f)

$$\left(\begin{array}{ccc|c} -5 & 3 & 3 & -5 \\ 3 & 5 & -2 & 16 \\ -1 & 1 & -2 & -8 \end{array} \right)$$

$$220c = 660 \quad | :220$$

$$-5a + 6 + 9 = -5$$

$$c = 3$$

$$-5a + 15 = -5 \quad | -15$$

$$-5a = -20 \quad | :(-5)$$

$$a = 4$$

$$\left(\begin{array}{ccc|c} -5 & 3 & 3 & -5 \\ 3 & 5 & -2 & 16 \\ -1 & 1 & -2 & -8 \end{array} \right) \begin{array}{l} | \cdot 3 \rightarrow | \cdot (-1) \rightarrow \\ | \cdot 5 \leftarrow + \\ | \cdot 5 \leftarrow + \end{array}$$

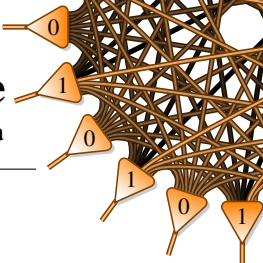
$$34b - 3 = 65 \quad | +3$$

$$34b = 68 \quad | :34$$

$$b = 2$$

$$\left(\begin{array}{ccc|c} -5 & 3 & 3 & -5 \\ 0 & 34 & -1 & 65 \\ 0 & 2 & -13 & -35 \end{array} \right) \begin{array}{l} \leftarrow + \\ | \cdot (-17) \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -5 & 3 & 3 & -5 \\ 0 & 34 & -1 & 65 \\ 0 & 0 & 220 & 660 \end{array} \right)$$



g)

$$\left(\begin{array}{ccc|c} 4 & 5 & -2 & 5 \\ 5 & 3 & 3 & 14 \\ 1 & 1 & -4 & -6 \end{array} \right)$$

$$\begin{aligned} -204z &= -408 & | :(-204) & & 4x + 5 - 4 &= 5 \\ & & & & 4x + 1 &= 5 & | -1 \\ & & & & 4x &= 4 & | :4 \end{aligned}$$

$$z = 2$$

$$x = 1$$

$$\left(\begin{array}{ccc|c} 4 & 5 & -2 & 5 \\ 5 & 3 & 3 & 14 \\ 1 & 1 & -4 & -6 \end{array} \right) \begin{array}{l} | \cdot 5 \leftarrow \\ | \cdot (-4) \leftarrow + \\ | \cdot (-4) \leftarrow + \end{array}$$

$$\begin{aligned} 13y - 44 &= -31 & | +44 \\ 13y &= 13 & | :13 \end{aligned}$$

$$y = 1$$

$$\left(\begin{array}{ccc|c} 4 & 5 & -2 & 5 \\ 0 & 13 & -22 & -31 \\ 0 & 1 & 14 & 29 \end{array} \right) | \cdot (-13) \leftarrow +$$

$$\left(\begin{array}{ccc|c} 4 & 5 & -2 & 5 \\ 0 & 13 & -22 & -31 \\ 0 & 0 & -204 & -408 \end{array} \right)$$

h)

$$\left(\begin{array}{ccc|c} -4 & 2 & -4 & -2 \\ -2 & -5 & 2 & -11 \\ -5 & -5 & 5 & -20 \end{array} \right) \begin{array}{l} | \cdot \frac{1}{2} \\ | \cdot \frac{1}{5} \end{array}$$

$$\begin{aligned} 4c &= -4 & | :4 & & -2a + 1 + 2 &= -1 \\ & & & & -2a + 3 &= -1 & | -3 \\ & & & & -2a &= -4 & | :(-2) \end{aligned}$$

$$c = -1$$

$$a = 2$$

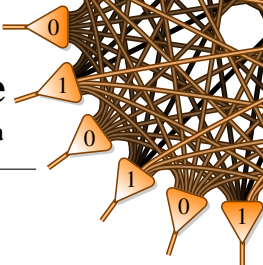
$$\left(\begin{array}{ccc|c} -2 & 1 & -2 & -1 \\ -2 & -5 & 2 & -11 \\ -1 & -1 & 1 & -4 \end{array} \right) \begin{array}{l} | \cdot (-1) \leftarrow \\ | \cdot (-1) \leftarrow \\ | \cdot 2 \leftarrow + \end{array}$$

$$\begin{aligned} -6b - 4 &= -10 & | +4 \\ -6b &= -6 & | :(-6) \end{aligned}$$

$$b = 1$$

$$\left(\begin{array}{ccc|c} -2 & 1 & -2 & -1 \\ 0 & -6 & 4 & -10 \\ 0 & -3 & 4 & -7 \end{array} \right) \begin{array}{l} | \cdot (-1) \leftarrow \\ | \cdot 2 \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -2 & 1 & -2 & -1 \\ 0 & -6 & 4 & -10 \\ 0 & 0 & 4 & -4 \end{array} \right)$$



i)

$$\left(\begin{array}{ccc|c} 4 & -1 & -1 & -5 \\ 5 & -1 & -3 & -16 \\ 2 & 4 & 1 & -13 \end{array} \right)$$

$$-66c = -330 \quad | :(-66)$$

$$4a + 4 - 5 = -5$$

$$c = 5$$

$$4a - 1 = -5 \quad | +1$$

$$4a = -4 \quad | :4$$

$$a = -1$$

$$\left(\begin{array}{ccc|c} 4 & -1 & -1 & -5 \\ 5 & -1 & -3 & -16 \\ 2 & 4 & 1 & -13 \end{array} \right) \begin{array}{l} | \cdot 5 \\ | \cdot (-4) \leftarrow + \\ | \cdot (-2) \leftarrow + \end{array}$$

$$-b + 35 = 39 \quad | -35$$

$$-b = 4 \quad | :(-1)$$

$$b = -4$$

$$\left(\begin{array}{ccc|c} 4 & -1 & -1 & -5 \\ 0 & -1 & 7 & 39 \\ 0 & -9 & -3 & 21 \end{array} \right) \begin{array}{l} | \cdot (-9) \\ \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} 4 & -1 & -1 & -5 \\ 0 & -1 & 7 & 39 \\ 0 & 0 & -66 & -330 \end{array} \right)$$

j)

$$\left(\begin{array}{ccc|c} -2 & 2 & -2 & -4 \\ -5 & 4 & -1 & -13 \\ -4 & 2 & -1 & -9 \end{array} \right) | \cdot \frac{1}{2}$$

$$-5z = 5 \quad | :(-5)$$

$$-x - 1 + 1 = -2$$

$$z = -1$$

$$-x = -2 \quad | :(-1)$$

$$x = 2$$

$$\left(\begin{array}{ccc|c} -1 & 1 & -1 & -2 \\ -5 & 4 & -1 & -13 \\ -4 & 2 & -1 & -9 \end{array} \right) \begin{array}{l} | \cdot (-5) \\ \leftarrow + \\ | \cdot (-4) \\ \leftarrow + \end{array}$$

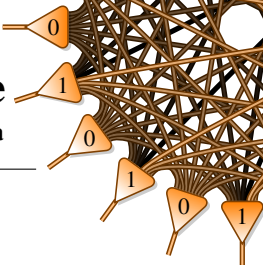
$$-y - 4 = -3 \quad | +4$$

$$-y = 1 \quad | :(-1)$$

$$y = -1$$

$$\left(\begin{array}{ccc|c} -1 & 1 & -1 & -2 \\ 0 & -1 & 4 & -3 \\ 0 & -2 & 3 & -1 \end{array} \right) \begin{array}{l} | \cdot (-2) \\ \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -1 & 1 & -1 & -2 \\ 0 & -1 & 4 & -3 \\ 0 & 0 & -5 & 5 \end{array} \right)$$



k)

$$\left(\begin{array}{ccc|c} -1 & 2 & -4 & 4 \\ 1 & 3 & 2 & 3 \\ 5 & -3 & 5 & 2 \end{array} \right)$$

$$61z = -61 \quad | : 61$$

$$z = -1$$

$$-x + 2 + 4 = 4$$

$$-x + 6 = 4 \quad | -6$$

$$-x = -2 \quad | : (-1)$$

$$x = 2$$

$$\left(\begin{array}{ccc|c} -1 & 2 & -4 & 4 \\ 1 & 3 & 2 & 3 \\ 5 & -3 & 5 & 2 \end{array} \right) \begin{array}{l} \left[\begin{array}{l} \leftarrow + \\ \leftarrow + \end{array} \right] \cdot 5 \\ \leftarrow + \end{array}$$

$$5y + 2 = 7 \quad | -2$$

$$5y = 5 \quad | : 5$$

$$y = 1$$

$$\left(\begin{array}{ccc|c} -1 & 2 & -4 & 4 \\ 0 & 5 & -2 & 7 \\ 0 & 7 & -15 & 22 \end{array} \right) \begin{array}{l} | \cdot 7 \leftarrow + \\ | \cdot (-5) \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -1 & 2 & -4 & 4 \\ 0 & 5 & -2 & 7 \\ 0 & 0 & 61 & -61 \end{array} \right)$$

l)

$$\left(\begin{array}{ccc|c} -1 & -2 & -3 & -23 \\ -1 & -1 & 4 & 17 \\ -4 & 1 & -4 & -7 \end{array} \right)$$

$$55z = 275 \quad | : 55$$

$$z = 5$$

$$-x - 10 - 15 = -23$$

$$-x - 25 = -23 \quad | +25$$

$$-x = 2 \quad | : (-1)$$

$$x = -2$$

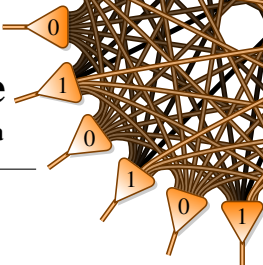
$$\left(\begin{array}{ccc|c} -1 & -2 & -3 & -23 \\ -1 & -1 & 4 & 17 \\ -4 & 1 & -4 & -7 \end{array} \right) \begin{array}{l} \left[\begin{array}{l} | \cdot (-1) \leftarrow + \\ | \cdot (-4) \leftarrow + \end{array} \right] \\ \leftarrow + \\ \leftarrow + \end{array}$$

$$y + 35 = 40 \quad | -35$$

$$y = 5$$

$$\left(\begin{array}{ccc|c} -1 & -2 & -3 & -23 \\ 0 & 1 & 7 & 40 \\ 0 & 9 & 8 & 85 \end{array} \right) \begin{array}{l} | \cdot 9 \leftarrow + \\ | \cdot (-1) \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -1 & -2 & -3 & -23 \\ 0 & 1 & 7 & 40 \\ 0 & 0 & 55 & 275 \end{array} \right)$$



m)

$$\left(\begin{array}{ccc|c} 5 & 1 & 1 & -7 \\ 2 & 4 & 4 & 8 \\ -4 & 3 & -2 & 7 \end{array} \right) \cdot \frac{1}{2}$$

$$-225z = -450 \quad | : (-225)$$

$$z = 2$$

$$5x + 1 + 2 = -7$$

$$5x + 3 = -7 \quad | -3$$

$$5x = -10 \quad | : 5$$

$$x = -2$$

$$\left(\begin{array}{ccc|c} 5 & 1 & 1 & -7 \\ 1 & 2 & 2 & 4 \\ -4 & 3 & -2 & 7 \end{array} \right) \begin{array}{l} \left[\begin{array}{l} \cdot 4 \\ \cdot (-5) \leftarrow + \end{array} \right] \\ \left[\begin{array}{l} \cdot 5 \leftarrow + \end{array} \right] \end{array}$$

$$-9y - 18 = -27 \quad | +18$$

$$-9y = -9 \quad | : (-9)$$

$$y = 1$$

$$\left(\begin{array}{ccc|c} 5 & 1 & 1 & -7 \\ 0 & -9 & -9 & -27 \\ 0 & 19 & -6 & 7 \end{array} \right) \begin{array}{l} \left[\begin{array}{l} \cdot 19 \\ \cdot 9 \leftarrow + \end{array} \right] \end{array}$$

$$\left(\begin{array}{ccc|c} 5 & 1 & 1 & -7 \\ 0 & -9 & -9 & -27 \\ 0 & 0 & -225 & -450 \end{array} \right)$$

n)

$$\left(\begin{array}{ccc|c} -1 & -1 & 1 & 6 \\ 5 & 3 & 4 & 4 \\ -2 & 2 & -4 & -8 \end{array} \right) \cdot \frac{1}{2}$$

$$6z = 24 \quad | : 6$$

$$z = 4$$

$$-x - 1 + 4 = 6$$

$$-x + 3 = 6 \quad | -3$$

$$-x = 3 \quad | : (-1)$$

$$x = -3$$

$$\left(\begin{array}{ccc|c} -1 & -1 & 1 & 6 \\ 5 & 3 & 4 & 4 \\ -1 & 1 & -2 & -4 \end{array} \right) \begin{array}{l} \left[\begin{array}{l} \cdot 5 \\ \cdot (-1) \end{array} \right] \\ \left[\begin{array}{l} \cdot 5 \\ \cdot (-1) \end{array} \right] \end{array}$$

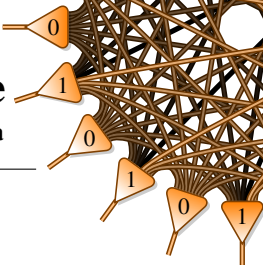
$$-2y + 36 = 34 \quad | -36$$

$$-2y = -2 \quad | : (-2)$$

$$y = 1$$

$$\left(\begin{array}{ccc|c} -1 & -1 & 1 & 6 \\ 0 & -2 & 9 & 34 \\ 0 & 2 & -3 & -10 \end{array} \right) \left[\begin{array}{l} \cdot 9 \\ \cdot (-1) \end{array} \right]$$

$$\left(\begin{array}{ccc|c} -1 & -1 & 1 & 6 \\ 0 & -2 & 9 & 34 \\ 0 & 0 & 6 & 24 \end{array} \right)$$



o)

$$\left(\begin{array}{ccc|c} -4 & -4 & 1 & -3 \\ 5 & 1 & 5 & 39 \\ 1 & -2 & 5 & 30 \end{array} \right)$$

$$9z = 45 \quad | : 9$$

$$z = 5$$

$$-4x + 4 + 5 = -3$$

$$-4x + 9 = -3 \quad | -9$$

$$-4x = -12 \quad | : (-4)$$

$$x = 3$$

$$\left(\begin{array}{ccc|c} -4 & -4 & 1 & -3 \\ 5 & 1 & 5 & 39 \\ 1 & -2 & 5 & 30 \end{array} \right) \begin{array}{l} | \cdot 5 \leftarrow + \\ | \cdot 4 \leftarrow + \\ | \cdot 4 \leftarrow + \end{array}$$

$$-16y + 125 = 141 \quad | -125$$

$$-16y = 16 \quad | : (-16)$$

$$y = -1$$

$$\left(\begin{array}{ccc|c} -4 & -4 & 1 & -3 \\ 0 & -16 & 25 & 141 \\ 0 & -12 & 21 & 117 \end{array} \right) \begin{array}{l} | \cdot (-3) \\ | \cdot 4 \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -4 & -4 & 1 & -3 \\ 0 & -16 & 25 & 141 \\ 0 & 0 & 9 & 45 \end{array} \right)$$

p)

$$\left(\begin{array}{ccc|c} -4 & 5 & 3 & 2 \\ 2 & 3 & -3 & 12 \\ -1 & 5 & -4 & 28 \end{array} \right)$$

$$164z = -820 \quad | : 164$$

$$z = -5$$

$$-4x + 5 - 15 = 2$$

$$-4x - 10 = 2 \quad | +10$$

$$-4x = 12 \quad | : (-4)$$

$$x = -3$$

$$\left(\begin{array}{ccc|c} -4 & 5 & 3 & 2 \\ 2 & 3 & -3 & 12 \\ -1 & 5 & -4 & 28 \end{array} \right) \begin{array}{l} | \cdot (-1) \\ | \cdot 2 \leftarrow + \\ | \cdot 4 \leftarrow + \end{array}$$

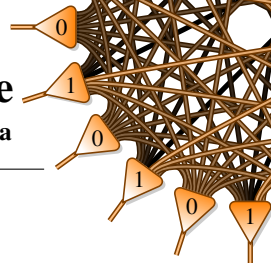
$$11y + 15 = 26 \quad | -15$$

$$11y = 11 \quad | : 11$$

$$y = 1$$

$$\left(\begin{array}{ccc|c} -4 & 5 & 3 & 2 \\ 0 & 11 & -3 & 26 \\ 0 & 15 & -19 & 110 \end{array} \right) \begin{array}{l} | \cdot 15 \\ | \cdot (-11) \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -4 & 5 & 3 & 2 \\ 0 & 11 & -3 & 26 \\ 0 & 0 & 164 & -820 \end{array} \right)$$



q)

$$\left(\begin{array}{ccc|c} 2 & 4 & 4 & -18 \\ -3 & 5 & 5 & -6 \\ -4 & -2 & 5 & 32 \end{array} \right) \left| \cdot \frac{1}{2} \right.$$

$$-77z = -154 \quad | :(-77)$$

$$z = 2$$

$$x - 10 + 4 = -9$$

$$x - 6 = -9 \quad | +6$$

$$x = -3$$

$$\left(\begin{array}{ccc|c} 1 & 2 & 2 & -9 \\ -3 & 5 & 5 & -6 \\ -4 & -2 & 5 & 32 \end{array} \right) \left| \begin{array}{l} \cdot 3 \\ \cdot 4 \end{array} \right. \left| \begin{array}{l} \leftarrow + \\ \leftarrow + \end{array} \right.$$

$$11y + 22 = -33 \quad | -22$$

$$11y = -55 \quad | :11$$

$$y = -5$$

$$\left(\begin{array}{ccc|c} 1 & 2 & 2 & -9 \\ 0 & 11 & 11 & -33 \\ 0 & 6 & 13 & -4 \end{array} \right) \left| \begin{array}{l} \cdot 6 \\ \cdot (-11) \end{array} \right. \left| \leftarrow + \right.$$

$$\left(\begin{array}{ccc|c} 1 & 2 & 2 & -9 \\ 0 & 11 & 11 & -33 \\ 0 & 0 & -77 & -154 \end{array} \right)$$

r)

$$\left(\begin{array}{ccc|c} 3 & 5 & -4 & -26 \\ -5 & -4 & -3 & 11 \\ 1 & -1 & -1 & 0 \end{array} \right)$$

$$-219c = -438 \quad | :(-219)$$

$$c = 2$$

$$3a - 15 - 8 = -26$$

$$3a - 23 = -26 \quad | +23$$

$$3a = -3 \quad | :3$$

$$a = -1$$

$$\left(\begin{array}{ccc|c} 3 & 5 & -4 & -26 \\ -5 & -4 & -3 & 11 \\ 1 & -1 & -1 & 0 \end{array} \right) \left| \begin{array}{l} \cdot 5 \\ \cdot 3 \end{array} \right. \left| \begin{array}{l} \leftarrow + \\ \leftarrow + \end{array} \right. \left| \cdot (-3) \leftarrow + \right.$$

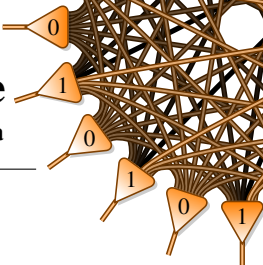
$$13b - 58 = -97 \quad | +58$$

$$13b = -39 \quad | :13$$

$$b = -3$$

$$\left(\begin{array}{ccc|c} 3 & 5 & -4 & -26 \\ 0 & 13 & -29 & -97 \\ 0 & 8 & -1 & -26 \end{array} \right) \left| \begin{array}{l} \cdot 8 \\ \cdot (-13) \end{array} \right. \left| \leftarrow + \right.$$

$$\left(\begin{array}{ccc|c} 3 & 5 & -4 & -26 \\ 0 & 13 & -29 & -97 \\ 0 & 0 & -219 & -438 \end{array} \right)$$



s)

$$\left(\begin{array}{ccc|c} -2 & -1 & 3 & 7 \\ -5 & -3 & -4 & -39 \\ -3 & 2 & -5 & -44 \end{array} \right)$$

$$-180z = -900 \quad | :(-180)$$

$$z = 5$$

$$-2x + 2 + 15 = 7$$

$$-2x + 17 = 7 \quad | -17$$

$$-2x = -10 \quad | :(-2)$$

$$x = 5$$

$$\left(\begin{array}{ccc|c} -2 & -1 & 3 & 7 \\ -5 & -3 & -4 & -39 \\ -3 & 2 & -5 & -44 \end{array} \right) \begin{array}{l} | \cdot (-5) \quad | \cdot (-3) \\ | \cdot 2 \leftarrow + \\ | \cdot 2 \leftarrow + \end{array}$$

$$-y - 115 = -113 \quad | +115$$

$$-y = 2 \quad | :(-1)$$

$$y = -2$$

$$\left(\begin{array}{ccc|c} -2 & -1 & 3 & 7 \\ 0 & -1 & -23 & -113 \\ 0 & 7 & -19 & -109 \end{array} \right) \begin{array}{l} | \cdot 7 \\ \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -2 & -1 & 3 & 7 \\ 0 & -1 & -23 & -113 \\ 0 & 0 & -180 & -900 \end{array} \right)$$

t)

$$\left(\begin{array}{ccc|c} -2 & 4 & 2 & 10 \\ -4 & 1 & -4 & -13 \\ 5 & -4 & -5 & -31 \end{array} \right) | \cdot \frac{1}{2}$$

$$-48c = -240 \quad | :(-48)$$

$$c = 5$$

$$-a - 2 + 5 = 5$$

$$-a + 3 = 5 \quad | -3$$

$$-a = 2 \quad | :(-1)$$

$$a = -2$$

$$\left(\begin{array}{ccc|c} -1 & 2 & 1 & 5 \\ -4 & 1 & -4 & -13 \\ 5 & -4 & -5 & -31 \end{array} \right) \begin{array}{l} | \cdot (-4) \quad | \cdot 5 \\ \leftarrow + \\ \leftarrow + \end{array}$$

$$-7b - 40 = -33 \quad | +40$$

$$-7b = 7 \quad | :(-7)$$

$$b = -1$$

$$\left(\begin{array}{ccc|c} -1 & 2 & 1 & 5 \\ 0 & -7 & -8 & -33 \\ 0 & 6 & 0 & -6 \end{array} \right) \begin{array}{l} | \cdot 6 \\ | \cdot 7 \leftarrow + \end{array}$$

$$\left(\begin{array}{ccc|c} -1 & 2 & 1 & 5 \\ 0 & -7 & -8 & -33 \\ 0 & 0 & -48 & -240 \end{array} \right)$$