

Lineare Gleichungssysteme lösen: Das Additionsverfahren (schwerer)

Aufgabe:

Löse die folgenden Gleichungssysteme mit Hilfe des Additionsverfahrens

a)
$$\begin{cases} -5x - 5y = -10 \\ -5x - 3y = -2 \end{cases}$$

b)
$$\begin{cases} 4x - 2y = 18 \\ 1x - 5y = 18 \end{cases}$$

c)
$$\begin{cases} -4x - 1y = -5 \\ -1x - 5y = 13 \end{cases}$$

d)
$$\begin{cases} 2x + 4y = -16 \\ 1x - 4y = 10 \end{cases}$$

e)
$$\begin{cases} -5x - 5y = -15 \\ 3x - 4y = 16 \end{cases}$$

f)
$$\begin{cases} -1x + 3y = -10 \\ 2x - 5y = 18 \end{cases}$$

g)
$$\begin{cases} 3x - 4y = 8 \\ 1x - 4y = 16 \end{cases}$$

h)
$$\begin{cases} 3x - 3y = -24 \\ 1x + 2y = 7 \end{cases}$$

Ein Erklärvideo zum Thema findest du unter dem folgenden Link



$$\begin{array}{l|l}
 \text{a)} & \begin{array}{l} -5x - 5y = -10 \\ -5x - 3y = -2 \end{array} \\
 & \begin{array}{l} \cdot (-1) \\ \cdot 1 \end{array} \\
 & \begin{array}{l} 5x + 5y = 10 \\ -5x - 3y = -2 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} 2y = 8 \\ \quad \quad \quad | : 2 \\ \mathbf{y = 4} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 -5x - 5 \cdot 4 = -10 & | \text{T} \\
 -5x - 20 = -10 & | +20 \\
 -5x = 10 & | :(-5) \\
 \mathbf{x = -2} &
 \end{array}$$

$$L = \{ (-2|4) \}$$

$$\begin{array}{l|l}
 \text{b)} & \begin{array}{l} 4x - 2y = 18 \\ 1x - 5y = 18 \end{array} \\
 & \begin{array}{l} \cdot (-1) \\ \cdot 4 \end{array} \\
 & \begin{array}{l} -4x + 2y = -18 \\ 4x - 20y = 72 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} -18y = 54 \\ \quad \quad \quad | : (-18) \\ \mathbf{y = -3} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 4x - 2 \cdot (-3) = 18 & | \text{T} \\
 4x + 6 = 18 & | -6 \\
 4x = 12 & | :4 \\
 \mathbf{x = 3} &
 \end{array}$$

$$L = \{ (3|-3) \}$$

$$\begin{array}{l|l}
 \text{c)} & \begin{array}{l} -4x - 1y = -5 \\ -1x - 5y = 13 \end{array} \\
 & \begin{array}{l} \cdot (-1) \\ \cdot 4 \end{array} \\
 & \begin{array}{l} 4x + 1y = 5 \\ -4x - 20y = 52 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} -19y = 57 \\ \quad \quad \quad | : (-19) \\ \mathbf{y = -3} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 -4x - 1 \cdot (-3) = -5 & | \text{T} \\
 -4x + 3 = -5 & | -3 \\
 -4x = -8 & | :(-4) \\
 \mathbf{x = 2} &
 \end{array}$$

$$L = \{ (2|-3) \}$$

$$\begin{array}{l|l}
 \text{d)} & \begin{array}{l} 2x + 4y = -16 \\ 1x - 4y = 10 \end{array} \\
 & \begin{array}{l} \cdot (-1) \\ \cdot 2 \end{array} \\
 & \begin{array}{l} -2x - 4y = 16 \\ 2x - 8y = 20 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} -12y = 36 \\ \quad \quad \quad | : (-12) \\ \mathbf{y = -3} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 2x + 4 \cdot (-3) = -16 & | \text{T} \\
 2x - 12 = -16 & | +12 \\
 2x = -4 & | :2 \\
 \mathbf{x = -2} &
 \end{array}$$

$$L = \{ (-2|-3) \}$$

$$\begin{array}{l|l}
 \text{e)} & \begin{array}{l} -5x - 5y = -15 \\ 3x - 4y = 16 \end{array} \\
 & \begin{array}{l} \cdot 3 \\ \cdot 5 \end{array} \\
 & \begin{array}{l} -15x - 15y = -45 \\ 15x - 20y = 80 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} -35y = 35 \\ \quad \quad \quad | : (-35) \\ \mathbf{y = -1} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 -5x - 5 \cdot (-1) = -15 & | \text{T} \\
 -5x + 5 = -15 & | -5 \\
 -5x = -20 & | :(-5) \\
 \mathbf{x = 4} &
 \end{array}$$

$$L = \{ (4|-1) \}$$

$$\begin{array}{l|l}
 \text{f)} & \begin{array}{l} -1x + 3y = -10 \\ 2x - 5y = 18 \end{array} \\
 & \begin{array}{l} \cdot 2 \\ \cdot 1 \end{array} \\
 & \begin{array}{l} -2x + 6y = -20 \\ 2x - 5y = 18 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} 1y = -2 \\ \quad \quad \quad | : 1 \\ \mathbf{y = -2} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 -1x + 3 \cdot (-2) = -10 & | \text{T} \\
 -1x - 6 = -10 & | +6 \\
 -1x = -4 & | :(-1) \\
 \mathbf{x = 4} &
 \end{array}$$

$$L = \{ (4|-2) \}$$

$$\begin{array}{l|l}
 \text{g)} & \begin{array}{l} 3x - 4y = 8 \\ 1x - 4y = 16 \end{array} \\
 & \begin{array}{l} \cdot (-1) \\ \cdot 3 \end{array} \\
 & \begin{array}{l} -3x + 4y = -8 \\ 3x - 12y = 48 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} -8y = 40 \\ \quad \quad \quad | : (-8) \\ \mathbf{y = -5} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 3x - 4 \cdot (-5) = 8 & | \text{T} \\
 3x + 20 = 8 & | -20 \\
 3x = -12 & | :3 \\
 \mathbf{x = -4} &
 \end{array}$$

$$L = \{ (-4|-5) \}$$

$$\begin{array}{l|l}
 \text{h)} & \begin{array}{l} 3x - 3y = -24 \\ 1x + 2y = 7 \end{array} \\
 & \begin{array}{l} \cdot (-1) \\ \cdot 3 \end{array} \\
 & \begin{array}{l} -3x + 3y = 24 \\ 3x + 6y = 21 \end{array} \\
 & \begin{array}{l} 1. \text{ und } 2. \text{ Gl.} \\ \text{addieren} \end{array} \\
 & \begin{array}{l} 9y = 45 \\ \quad \quad \quad | : 9 \\ \mathbf{y = 5} \end{array}
 \end{array}$$

In 1. Gleichung einsetzen:

$$\begin{array}{l|l}
 3x - 3 \cdot 5 = -24 & | \text{T} \\
 3x - 15 = -24 & | +15 \\
 3x = -9 & | :3 \\
 \mathbf{x = -3} &
 \end{array}$$

$$L = \{ (-3|5) \}$$