

### A.1.1

**a**

Ja

**b**

Ja (må omskrives)

**c**

Nei (kvadratledd)

**d**

Ja

**e**

Nei, produktledd

### A.1.2

**a**

$$\begin{aligned}\mathbf{x} - 5\mathbf{y} &= (1, 2, 3, 4) - 5(10, 1, 0, 4) \\ &= (1 - 50, 2 - 5, 3, 4 - 20) \\ &= (49, -3, 3, -16)\end{aligned}$$

**b**

$$\begin{aligned}\frac{3}{2}\mathbf{z} &= \frac{3}{2}(12, 7, 3) \\ &= (18, \frac{21}{2}, \frac{9}{2})\end{aligned}$$

**c**

$\mathbf{x} - 5\mathbf{y} + \frac{3}{2}\mathbf{z}$ , ikke mulig grunnet forskjellig antall dimensjoner

**d**

$$\begin{aligned}\mathbf{x} \cdot 3\mathbf{y} &= (1, 2, 3, 4) \cdot (30, 3, 0, 12) \\ &= (1, 6, 0, 48)\end{aligned}$$

### A.1.3

$$(x_1, x_2, x_3) = (4, 3, 7)$$

$$(x_1, x_2, x_3, x_4, x_5) = (1, 18, 2, 9, 3)$$

$$\mathbf{x} = (2, 0, 3)$$

$$\mathbf{y} = (-3, 0, 2)$$

$$\mathbf{x} = (2, 1, 3)$$

$$\mathbf{y} = (2, -5, 1)$$

### A.1.4

**a**

$$7x - 5x = 3$$

$$2x = 3$$

$$x = \frac{3}{2}$$

**b**

$$7x - 5y = 3$$

$$7x - 5s_1 = 3$$

$$7x = 3 + 5s_1$$

$$x = \frac{3}{7} + \frac{5}{7}s_1$$

$$\left\{ \left( \frac{3}{7} + \frac{5}{7}s_1, s_1 \right) : s_1 \in R \right\}$$

**c**

$$7x - 5y = 3$$

$$x + 5y = 1$$

$$8x = 4$$

$$x = \frac{1}{2}$$

$$\frac{1}{2} + 5y = 1$$

$$5y = \frac{1}{2}$$

$$y = \frac{1}{10}$$

**c**

$$y = 2 - 2x = 2(1 - x)$$

$$2x + 3y = 8$$

$$2x + 3 \cdot 2(1 - x) = 8$$

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

$$-2x = 1$$

$$x = -\frac{1}{2}$$

$$y = 2 - 2\left(-\frac{1}{2}\right) = 3$$

$$x + y + z = 3$$

$$z = 3 - x - y = 3 + \frac{1}{2} - 3 = \frac{1}{2}$$

### **A.1.5**

**a**

$$x + y + x = 0$$

$$x + y - x = 0$$

$$z = 0$$

$$x + y = 0$$

$$(x, y, z) \in \{(s_1, -s_1, 0) : s_1 \in R\}$$

**b**

$$x + y - z = 3$$

$$2x + 2y - 2z = 6$$

$$(x, y, z) \in \{(3 + s_1 - s_2, s_2, s_1) : s_1, s_2 \in R\}$$

**c**

$$x + y + z + w = 15$$

$$x - 2y + 4z - w = 12$$

$$2x - y + 5z = 3$$

$$y = -3 + 5s_3 + 2s_1$$

$$(x, y, z, w) \in \{(s_1, -3 + 5s_3 + 2s_1, s_3, 15 - s_1 - s_3 + 3 - 5s_3 - 2s_1) : s_1, s_3 \in R\}$$

$$(x, y, z, w) \in \{(s_1, -3 + 5s_3 + 2s_1, s_3, 18 - 6s_3 - 3s_1) : s_1, s_3 \in R\}$$

**d**

$$x - 2y + 2z = 4$$

$$2x - 4y + 4z = 2$$

$$2x - 4y + 4z = 8$$

Ukompatibelt

### **A.1.6**

**a**

$$3x_1 - 5x_2 + 4x_3 = 7$$

$$x_1 = \frac{7}{3} + \frac{5}{3}s_1 - \frac{4}{3}s_2$$

$$(x_1, x_2, x_3) \in \left\{ \left( \frac{7}{3} + \frac{5}{3}s_1 - \frac{4}{3}s_2, s_1, s_2 \right) : s_1, s_2 \in R \right\}$$

**b**

$$L_1 : \quad x_1 + x_2 + 2x_3 = 8$$

$$L_2 : \quad -x_1 - 2x_2 + 3x_3 = 1$$

$$L_3 : \quad 3x_1 - 7x_2 + 4x_3 = 10$$

$$L_1 + L_2 : \quad -x_2 + 5x_3 = 9$$

$$x_2 = 5x_3 - 9$$

$$2L_1 + L_2 : \quad x_1 + 7x_3 = 17$$

$$x_1 = 17 - 7x_3$$

$$L_3 : \quad 51 - 21x_3 - 35x_3 + 63 + 4x_3 = 10$$

$$104 - 52x_3 = 0$$

$$x_3 = 2$$

$$L_1 + L_2 : \quad x_2 = 5x_3 - 9 = 1$$

$$2L_1 - L_2 : \quad x_1 = 17 - 7x_3 = 3$$

**c**

$$\begin{array}{ll}
 L_1 : & 2x - 3y = -2 \\
 L_2 : & 2x + y = 1 \\
 L_3 : & 3x + 2y = 1 \\
 L_2 - L_1 : & 4y = 3 \\
 & y = \frac{3}{4} \\
 L_3 - \frac{3}{2}L_2 : & \frac{1}{2}y = -\frac{1}{2} \\
 & y = -1
 \end{array}$$

Ligningsettet er inkompatibelt

**d**

$$\begin{array}{ll}
 L_1 : & 2x_1 + 2x_2 + 2x_3 = 0 \\
 L_2 : & -2x_1 + 5x_2 + 2x_3 = 1 \\
 L_3 : & 8x_1 + x_2 + 4x_3 = -1 \\
 3L_1 - L_2 : & 8x_1 + x_2 + 5x_3 = 1 \\
 \\ 
 L_1 + L_2 : & 7x_2 + 4x_3 = 1 \\
 & x_3 = \frac{1}{4}(1 - 7x_2) \\
 L_1 : & x_1 + x_2 + x_3 = 0 \\
 L_1 : & x_1 = -x_2 - x_3 \\
 & x_1 = -x_2 - \frac{1}{4} + \frac{7}{4}x_2 = \frac{3}{4}x_2 - \frac{1}{4} \\
 & x_1 = 3s - \frac{1}{4} \\
 & x_2 = 4s \\
 & x_3 = \frac{1}{4} - 7s \\
 & (x_1, x_2, x_3) \in \left\{ \left( 3s - \frac{1}{4}, 4s, \frac{1}{4} - 7s \right) : s \in R \right\}
 \end{array}$$

**e**

$$\begin{array}{ll}
 L_4 : & 3x - 3w = -3 \\
 x - w = -1 & \\
 L_3 - 2L_2 : & -5x + 5w = 5 \\
 x - w = -1 &
 \end{array}$$

**A.1.7**

**A.1.8**

- To av linjene er parallelle: Ingen løsninger

- Linjene skjærer hverandre i samme punkt: En løsning
- Linjene skjærer hverandre i forskjellig punkt: Ingen løsning
- Alle tre linjene sammenfaller: Uendelig mange løsninger