Exercise 2

Paper 1 style · No calculator

2 7 marks AHL 3.18 · 1.16 ●●● Demanding

Consider the system of equations

$$x + y - z = 1, \qquad x - y + 2z = 3, \qquad 3x - y + 3z = k,$$

where $k \in \mathbb{R}$.

(a) Find the value of k for which the system has infinitely many solutions. **[3]**

(b) For this value of k, find the general solution of the system. **[3]**

(c) Interpret the general solution geometrically. **[1]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$R_2 - R_1$: $-2y + 3z = 2$; $R_3 - 3R_1$: $-4y + 6z = k - 3$ **M1**

$R_3 - 2R_2$: $0 = k - 7$ **A1**

$k = 7$ **A1**

Total 3 marks

MARKSCHEME (b)

let $z = 2t$: $y = 3t - 1$ **M1**

$x = 1 - y + z = 2 - t$ **A1**

$(x, y, z) = (2 - t, 3t - 1, 2t)$ **A1**

Total 3 marks

Note A parameter for one unknown.

Note Or an equivalent form.

MARKSCHEME (c)

the three planes meet in a line **A1**

Total 1 mark