

No books, watches, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. (3 marks) If a system of equations has more equations than variables, can it have a solution? If so, give an example and if not, explain why.

yes,

$$x = 1$$

$$2x = 2$$

has a solution, namely $x = 1$.

Question 2. (4 marks) Choose h and k such that the augmented matrix shown has each of the following: one solution, no solution and infinitely many solutions. Justify your answer!

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & h & k \end{bmatrix} \quad \left. \begin{array}{l} x + 2y = 2 \\ 2x + hy = k \end{array} \right\} \Rightarrow \begin{array}{l} x = -2y + 2 \\ x = -\frac{h}{2}y + \frac{k}{2} \end{array}$$

one solution: For one solution either the lines ^{need to} have different x -int. and different slope or same x -int and different slope. In any case $k \in \mathbb{R}$ and $-2 \neq -\frac{h}{2}$

no solutions: For no solutions the lines ^{need to} have different x -int. and same slope. So $\frac{k}{2} \neq 2$ and $-2 = -\frac{h}{2}$
 $h \neq 4$ $k \neq 4$ $h = 4$

infinitely many solutions: For ∞ many solutions the lines need to have the same slope and x -int. So $-2 = -\frac{h}{2}$ and $2 = \frac{k}{2}$
 $h = 4$ $k = 4$

Question 3. (3 marks) Given the linear system

$$\begin{cases} x - y + z = b_1 \\ 2x - 2y - 2z = b_2 \\ x + 3y - 5z = b_3 \end{cases}$$

Determine the b_i if the linear system has the particular solution $(3, -2, 1)$.

Since the system has $(3, -2, 1)$ as a solution, the system needs to be satisfied by $(3, -2, 1)$.

$$b_1 = (3 - (-2) + 1) = 6$$

$$b_2 = 2(3) - 2(-2) - 2(1) = 8$$

$$b_3 = 3 + 3(-2) - 5(1) = -8.$$