Name Solution

Mathematics 1553

Quiz 1

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Section H: left / center / middle

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1. For which h is the following system of equations inconsistent?

$$x - 2y - 3z = 4$$
$$-3x + 6y + hz = 0$$

$$\left(\begin{array}{ccc|c} 1 & -2 & -3 & 4 \\ -3 & 6 & h & 0 \end{array}\right)$$

$$\downarrow \quad 3R_1 + R_2 \to R_2$$

$$\left(\begin{array}{ccc|c} 1 & -2 & -3 & 4 \\ 0 & 0 & -9+h & 12 \end{array}\right)$$

inconsistent when $-9 + h = 0$

$$\boxed{h = 9}$$

Turn the page over!

Find the reduced row echelon form of the following (augmented) matrix

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

$$\left(\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ -2 & -3 & 1 & 0 \\ 3 & 5 & 0 & 0 \end{array}\right) \xrightarrow[3R_1 - R_3 \to R_3]{2R_1 + R_2 \to R_2} \left(\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & 1 & 3 & 0 \\ 0 & 1 & 3 & 0 \end{array}\right)$$

$$\xrightarrow{R_2 - R_3 \to R_3} \left(\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right) \xrightarrow{R_1 - 2R_2 \to R_1} \left(\begin{array}{ccc|c} 1 & 0 & -5 & 0 \\ 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right)$$

Describe (in parametric form) the general solution to the system of equations:

$$\begin{aligned} x_1 + 2x_2 + x_3 &= 0 \\ -2x_1 - 3x_2 + x_3 &= 0 \\ 3x_1 + 5x_2 &= 0 \end{aligned}$$

$x_1 - 5x_3 = 0$

$x_2 + 3x_3 = 0$

$$\Rightarrow \begin{cases} x_1 = 5x_3 \\ x_2 = -3x_3 \\ x_3 \text{ is free} \end{cases}$$