

Name SOLUTION

Mathematics 1553

Quiz 1

Prof. Margalit

Section H: left / center / middle

25 January 2016

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

$$x - 2y - 3z = 4$$

$$-3x + 6y + hz = 0$$

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

$$\downarrow 3R_1 + R_2 \rightarrow R_2$$

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

inconsistent when $-9 + h = 0$

$$\boxed{h = 9}$$

Turn the page over!

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

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

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

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

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

$$x_1 + 2x_2 + x_3 = 0$$

$$-2x_1 - 3x_2 + x_3 = 0$$

$$3x_1 + 5x_2 = 0$$

$$x_1 - 5x_3 = 0$$

$$x_2 + 3x_3 = 0$$

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