

SOLUTIONS

MATH 222, QUIZ 1.

NAME _____

ROW _____

Show all steps for credit.

Q1. (4 pts.) Find all solutions of the equations

$$x_1 + x_2 + x_3 = 3$$

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

$$3x_1 + 4x_2 + x_3 = 8.$$

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 3 \\ 1 & 2 & -1 & 2 \\ 3 & 4 & 1 & 8 \end{array} \right) \xrightarrow{\substack{R_2 - R_1 \\ R_3 - 3R_1}} \left(\begin{array}{ccc|c} 1 & 1 & 1 & 3 \\ 0 & 1 & -2 & -1 \\ 0 & 1 & -2 & -1 \end{array} \right)$$

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

Take $x_3 = t$,

$$x_2 = 2t - 1$$

$$x_1 + x_2 + x_3 = 3, \quad x_1 = 4 - 3t$$

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 4 - 3t \\ 2t - 1 \\ t \end{pmatrix}$$

Q2. (4 pts.) Find the values of a and b for which the system

$$\left(\begin{array}{ccc|c} 1 & 1 & 3 & 1 \\ 1 & 2 & 4 & 3 \\ 1 & 3 & a & b \end{array} \right)$$

is inconsistent.

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

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

To be inconsistent we must have
 $a = 5, b \neq 5$.

Q3. (2 pts) Is it true that $AB = BA$ for

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 7 & 4 \\ 6 & 7 \end{pmatrix}?$$

$$\begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 7 & 4 \\ 6 & 7 \end{pmatrix} = \begin{pmatrix} 19 & 18 \\ 27 & 19 \end{pmatrix}$$

$$\begin{pmatrix} 7 & 4 \\ 6 & 7 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix} = \begin{pmatrix} 19 & 18 \\ 27 & 19 \end{pmatrix}$$

Yes $AB = BA$