MATH 203-01 QUIZ 1 AUG 29, 2014

1. Find the general solution to $Ax = b$, where

$$A = \begin{pmatrix} 1 & 0 & -2 & 2 \\ 1 & 1 & 0 & 2 \\ 2 & 1 & -2 & 5 \end{pmatrix} \text{ and } b = \begin{pmatrix} 7 \\ 3 \\ 15 \end{pmatrix}.$$

2. Based on your work in 1., would you say that the columns of A span $\mathbb{R}^4$, $\mathbb{R}^3$, or neither? Why?

Solutions: 1. $(A \vdots b) =$

$$\begin{pmatrix} 1 & 0 & -2 & 2 & 7 \\ 1 & 1 & 0 & 2 & 3 \\ 2 & 1 & -2 & 5 & 15 \end{pmatrix}$$

$$\sim \begin{pmatrix} 1 & 0 & -2 & 2 & 7 \\ 0 & 1 & 2 & 0 & -4 \\ 2 & 1 & -2 & 5 & 15 \end{pmatrix}$$

$$\sim \begin{pmatrix} 1 & 0 & -2 & 2 & 7 \\ 0 & 1 & 2 & 0 & -4 \\ 0 & 1 & 2 & 1 & 1 \end{pmatrix}$$

$$\sim \begin{pmatrix} 1 & 0 & -2 & 2 & 7 \\ 0 & 1 & 2 & 0 & -4 \\ 0 & 0 & 0 & 1 & 5 \end{pmatrix}$$

end forward phase.

$$\sim \begin{pmatrix} \boxed{1} & 0 & -2 & 0 & -3 \\ 0 & \boxed{1} & 2 & 0 & -4 \\ 0 & 0 & 0 & \boxed{1} & 5 \end{pmatrix}$$

end backward phase.

$\boxed{}$ = pivots.

x_1, x_2, x_4 = basic var.s

x_3 = free var.

general solution:

$x_1 = -3 + 2x_3$

$x_2 = -4 - 2x_3$

$x_3 = \text{free}$

$x_4 = 5.$

done 1.

2. Columns of A are in $\mathbb{R}^3$, so they can't span $\mathbb{R}^4$. A has a pivot in every row, so the columns of A <u>span</u> $\mathbb{R}^3$.

done 2.