

Math 250

Name (Print): _____

Fall 2013

Quiz 7

1. (10 pts) Find a basis for (a) the column space and (b) the null space of the following matrix

$$\begin{bmatrix} 1 & 2 & 4 \\ -1 & -1 & -1 \\ -1 & 0 & 2 \end{bmatrix}$$

Ans: The REF form of the matrix is

$$\begin{bmatrix} 1 & 2 & 4 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{bmatrix}$$

The first and second column of the REF form are independent. So a basis for the column space is

$$\left\{ \begin{bmatrix} 1 \\ -1 \\ -1 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix} \right\}$$

The vector form of the solution to $Ax = 0$ is

$$\begin{bmatrix} 2x_3 \\ -3x_3 \\ x_3 \end{bmatrix}$$

So a basis for the null space is

$$\left\{ \begin{bmatrix} 2 \\ -3 \\ 1 \end{bmatrix} \right\}$$

2. (10 pts) Find a generating set for

$$\left\{ \begin{bmatrix} -r + 4t \\ r - s + 2t \\ 3t \\ r - t \end{bmatrix} \in R^4, r, s, t \text{ are scalars} \right\}.$$

Ans:

$$\begin{bmatrix} -r + 4t \\ r - s + 2t \\ 3t \\ r - t \end{bmatrix} = r \begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix} + s \begin{bmatrix} 0 \\ -1 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} 4 \\ 2 \\ 3 \\ -1 \end{bmatrix}.$$

So a generating set is

$$\left\{ \begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ -1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 4 \\ 2 \\ 3 \\ -1 \end{bmatrix} \right\}$$