Name: KEY

Quiz 8
Math 2250, Fall 2015 **November 4, 2015** **R. Bruner**

1. For each of the following, determine whether it is a subspace of $\mathbf{R}^3$ or not. Explain why it is or is not a subspace.

$$(a)\left\{\begin{bmatrix} x \\ y \\ z \end{bmatrix} \mid x = y+1\right\} \qquad (b)\left\{\begin{bmatrix} x \\ y \\ z \end{bmatrix} \mid x = y+z\right\}$$

2. Find a subset of $\left\{\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}\right\}$ which forms a basis for the subspace spanned by these vectors.

1. (a) NOT: $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix}$, which is not in there, but $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ is.

(b) $= \mathrm{Nul}(\begin{bmatrix} 1 & -1 & -1 \end{bmatrix})$ so is a subspace.

2. $$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 0 & -1 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \xrightarrow[-R_1]{-R_1} \begin{array}{c} \begin{array}{cccc} * & * & & \end{array} \\ \begin{bmatrix} \underline{1} & 1 & 1 & 0 \\ 0 & \underline{-1} & -2 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

Two pivots in columns 1&2

$\left\{\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}\right\}$ is therefore a basis.

(In fact, any two of these vectors will work.)