Day 7

① A is row-equivalent to

$$R=\begin{bmatrix} 1 & 8 & 0 & 0 & 2 & 0 \\ 0 & 0 & 1 & 0 & 3 & 1 \\ 0 & 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Therefore, columns ___, ___, and ___ of A are linearly independent and have the same _____ as all the columns of A. Also, the 2nd column of A equals ___ times the 1st column of A. We also see that columns ___ and ___ of A add to equal column ___.

Day 7

(2) $\left\langle \begin{bmatrix} 1 \\ 5i \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \end{bmatrix} \right\rangle = ?$

(3) Manually perform Gram-Schmidt to find orthogonal vectors with same span as $\begin{bmatrix} 2 \\ 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 3 \\ 0 \\ 10 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 4 \\ 1 \end{bmatrix}$.

(Compare to examples in section O.)

(4) Find orthonormal vectors with same span as the orthogonal vectors $\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ -1 \\ -1 \end{bmatrix}$.

(5) Let $\vec{u} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$.

Which of the following vectors are orthogonal both to $\vec{u}$ and to $\vec{v}$?

$$\begin{bmatrix} 0 \\ 3 \\ -2 \end{bmatrix}, \begin{bmatrix} 3 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 5 \\ -1 \\ -1 \end{bmatrix}, \begin{bmatrix} 3 \\ -1 \\ 0 \end{bmatrix}$$

(6) Sort these vectors from least norm to greatest norm:

$$\begin{bmatrix} 3 \\ 2+i \end{bmatrix}, \begin{bmatrix} 3 \\ 2-2i \end{bmatrix}, \begin{bmatrix} 0 \\ 4 \end{bmatrix}, \begin{bmatrix} -3i \\ -3 \end{bmatrix}$$