Discussion — June 22

Linear combinations

1. Write $\begin{bmatrix} 3 \\ 5 \end{bmatrix}$ as a lin.comb. of $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$, if possible.

2. Write $\begin{bmatrix} 3 \\ 5 \\ -2 \end{bmatrix}$ as a lin.comb. of $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$, if possible.

3. What are all the ways $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ can be written as a linear combination of $\begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \end{bmatrix}$, and $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$?

Span

1. Geometrically, describe $\text{Span}\left\{ \begin{bmatrix} 1 \\ 1 \end{bmatrix} \right\}$.

2. Geometrically, describe $\text{Span}\left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix} \right\}$.

3. What vector is <u>always</u> in the span of any collection of vectors in $\mathbb{R}^n$?

4. What vectors $\vec{u}, \vec{v} \in \mathbb{R}^2$ are such that $\text{Span}\{\vec{u}, \vec{v}\} = \mathbb{R}^2$? (in other words, "which span $\mathbb{R}^2$"?)

5. What vectors are in $\text{Span}\left\{ \begin{bmatrix} 0 \\ 0 \end{bmatrix} \right\}$?

Logic

1. If it is raining, there are puddles on the ground.
   a) If it is not raining, then what?
   b) If there are puddles on the ground, then what?
   c) If there are no puddles on the ground, then what?

   } if you can conclude anything. otherwise, give a plausible scenario.

2. For every cute cat, there is a cuter cat.
   There is a cute cat, cuter than every other cat.

   Do these mean the same thing? How would you disprove them? (ie., what are their logical negations?)