

1.3 Handwrite

Welcoming Environment: Actively listen to others and encourage everyone to participate! Keep an open mind as you engage in our class activities, explore consensus and employ collective thinking across barriers. Maintain a professional tone, show respect and courtesy, and make your contributions matter.

Discuss and keep track of any questions your group has. Ask me questions during group work time as well as when I bring us back together. Try to help each other solidify and review the language of linear algebra, algebra, visualizations and intuition from this section, including those related to:

- algebra of vectors: coordinates, addition of vectors, scalar multiplication of vectors, properties like associativity under addition (property ii on p. 29), a linear combination with weights, zero vector, span of a set of vectors=all the linear combinations, is a vector in the span?, vector equation \rightarrow augmented matrix
- geometry of vectors in 2D and 3D: directed segment from origin on standard mathematical axes, parallelogram for addition, on same line for scalar multiplication of vectors, origin=zero vector, a linear combination geometrically in the plane or 3D, span=all the linear combinations geometrically in the plane or 3D, spaces of subsets of \mathbb{R}^n spanned by vectors

Take out your notes from the activities due today as well as the fill-in guide. Use them and each other to respond to the following by handwriting in the language of our class. Use only what we have covered so far in our readings, videos and quizzes.

1. **Building Community:** What are the preferred first names of those sitting near you? If you weren't able to be there, give reference to anyone you had help from or write N/A otherwise.
2. a) Given \vec{u} and \vec{v} as below, sketch and label on the same plot three vectors: $\vec{u} + \vec{v}$, $-2\vec{u}$, and $-2\vec{u} + \vec{v}$



- b) I created \vec{u} and \vec{v} as two vectors in \mathbb{R}^3 using standard mathematical axes with x pointing out of the board, y to the right, and z up. Are all their linear combinations $c_1\vec{u} + c_2\vec{v}$ in a plane in \mathbb{R}^3 ?
3. Consider holding your thumb, pointer finger, and middle finger as in visualizations of the right-hand rule (search the internet if you aren't familiar with this). What do they span?

4. Let $\vec{v}_1 = \begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} -5 \\ -8 \\ 2 \end{bmatrix}$,

a) Give a geometric description of the span $\{\vec{v}_1, \vec{v}_2\}$.

b) For what values of h is $\vec{b} = \begin{bmatrix} 3 \\ -5 \\ h \end{bmatrix}$ in the span of $\{\vec{v}_1, \vec{v}_2\}$? Use strict Gaussian elimination by-hand on the augmented matrix $[\vec{v}_1 \ \vec{v}_2 \ \vec{b}]$ —with h left general and don't scale the rows but do use replacement and stop at ref—and reason from row echelon form about consistency. Show the elementary row operations and show work/reasoning.

c) Is $h = 3$, i.e. $\begin{bmatrix} 3 \\ -5 \\ 3 \end{bmatrix}$ a linear combination of \vec{v}_1 and \vec{v}_2 ?

Next, as time allows before I bring us back together, work on the additional activities including any pollev activities and respond in your notes rather than here.

Help each other and PDF responses to ASULearn: If you are finished with the handwrite and additional activities before I bring us back together, first ensure that your entire group is finished too, and if not, help each other. Then submit your handwrite, continue reviewing and solidifying or discuss upcoming class work.

Collate your handwritten responses, preferably on this handout, into one full size multipage PDF for submission in the ASULearn assignment. I recommend you turn it in sometime today, but you have until the morning before the next class.