2.1 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:

- matrices: diagonal matrix [and main diagonal], zero matrix
- matrix operations: matrix addition, scalar multiplication of a matrix, matrix multiplication, powers of a matrix, left (or right) multiplication, transpose of a matrix
- matrix multiplication by linear combinations of the columns of A using weights from the corresponding column of B or by the dot products of a row of A with the corresponding column of B.
- algebraic properties that do hold for matrix multiplication: associativity and one-sided distributivity
- algebraic properties that don't hold for matrix multiplication: commutativity

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) Let $A = \begin{bmatrix} -1 & 3 \\ 2 & 4 \\ 5 & -3 \end{bmatrix}$ & $B = \begin{bmatrix} 4 & -2 \\ -2 & 3 \end{bmatrix}$. Compute AB by A times each column of B. Show work.

   b) Compute AB by the row-column multiplications directly (dot products) and show work.

3. a) Suppose that $CA = I_{n\times n}$. We are not given what C and A are here in part a) so we'll leave them general and use matrix algebra. Show that the columns of A are linearly independent—that the equation $A\vec{x} = \vec{0}$ has only the trivial solution—as follows:

   - Write $A\vec{x} = \vec{0}$ below where there is space.
   - Then multiply by C on the left of each side of the equation $A\vec{x} = \vec{0}$, so that $C(A\vec{x}) = C\vec{0}$.
   - Next apply properties of matrix multiplication to reduce and show we have only the trivial solution. Be sure to apply associativity, substitution of the assumption $CA = I_{n\times n}$, and definitions of multiplication by $I_{n\times n}$ and multiplication by $\vec{0}$ in order to reduce to the trivial solution.
   - Look back to make sure you have shown all the steps and properties and name them too, if you haven't already.

   b) Can A have more columns than rows?

   c) Multiply $C = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ and $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}$ to show they satisfy the condition $CA = I_{n\times n}$ even though they aren't square matrices (FYI, $AC \neq I_{n\times n}$ as it has a row of zeros).

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.