Week 10: Final Review!
MATH 4A

TA: Jerry Luo
jerryluo8@math.ucsb.edu
Website: math.ucsb.edu/∼jerryluo8
Office Hours: Monday 9:30-10:30AM, South Hall 6431X
Math Lab hours: Monday 3-5PM, South Hall 1607

Disclaimer: Since I am not the one writing the exam, I cannot guarantee this practice "exam" will look anything like the final. However, I reckon if you can do these without trouble, you're probably quite fine for the final.

4-1.5 Let $v = \begin{bmatrix} -4 \\ -6 \\ -8 \end{bmatrix}$, $u = \begin{bmatrix} -3 \\ -3 \\ 8+k \end{bmatrix}$, and $w = \begin{bmatrix} -4 \\ -1 \\ 2 \end{bmatrix}$. The set $\{v, u, w\}$ is linearly independent unless $k =$?

4-2.5 Let $v_1 = \begin{bmatrix} -1 \\ -2 \end{bmatrix}$ and $v_2 = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$. Suppose $T(v_1) = \begin{bmatrix} -12 \\ 8 \end{bmatrix}$ and $T(v_2) = \begin{bmatrix} 19 \\ -9 \end{bmatrix}$. For an arbitrary vector $v = \begin{bmatrix} x \\ y \end{bmatrix}$, find $T(v)$.

5-2.12 Let $A = \begin{bmatrix} -1 & -3 & -2 \\ 1 & 3 & 2 \\ -2 & -6 & -4 \end{bmatrix}$. Find a basis for the null space (kernel) of A.

6-1.4 Find the determinant: $C = \begin{bmatrix} -1 & 2 & -2 & 0 \\ 0 & 0 & 3 & -1 \\ 3 & 0 & -1 & 0 \\ -2 & 1 & 0 & -2 \end{bmatrix}$

7-1.10 Consider the ordered bases $B = (x, -(1+5x))$ and $C = (2, 2x-4)$ for polynomials of degree less than 2. Let $E = (1, x)$ be the standard basis.
Hint: Don't reinvent the wheel!

(a) Find T_C^E, the transition matrix from C to E.

(b) Find T_B^E.

(c) Find T_E^B.

(d) Find T_B^C.

8-1.8 Consider $A = \begin{bmatrix} 7 & 5 & -6 \\ -6 & -4 & 6 \\ 5 & 5 & -4 \end{bmatrix}$. Find the eigenvalues of A and its corresponding eigenvectors.

9-1.1 Let $A = \begin{bmatrix} 6 & -3 & -13 \\ 1 & 2 & 5 \\ 3 & -3 & -10 \end{bmatrix}$. Suppose $\begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ are eigenvectors. Then what are the eigenvalues?

9-1.4 Let $A = \begin{bmatrix} 5 & 2 \\ 0 & 3 \end{bmatrix}$. Diagonalize A. Compute A^{500}.

9-1.11 Let $A = \begin{bmatrix} -4 & 0 & 0 \\ -1 & -5 & 1 \\ -3 & -1 & -3 \end{bmatrix}$. Find the real eigenvalue of A, it's multiplicity, and the dimension of its eigenspace.