Some information about Exam 1

To be given in class on Wednesday, October 12

No notes/references/notecards, etc.
No calculators
Covers all material from lectures, handouts in class or posted in the syllabus online, material we covered in text/assigned readings in textbook, etc. up through Section 2.6. Nothing on determinants except possibly a bit about determinants for 2×2 matrices, as presented in Section 2.2 while discussing inverses.

There will be a mix of types of question; I don't know the proportions yet. The following is meant to give you an feeling for what kinds of questions to expect. But I may be able also to think of other styles of question with the same sort of “short answer” spirit.

- Some true/false questions (the t/f questions that appear in the exercise at the end of almost every section are good examples). Such questions are not worded to be “tricky” but they are worded to see if you actually know the meaning of the terms and how the ideas come together.

- Some short answer questions: an example might be something like

  A 3×4 matrix A row reduces to echelon form $\begin{bmatrix} 2 & 0 & 1 & 1 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$. Write the solutions of $A\boldsymbol{x} = \mathbf{0}$ in parametric vector form.

  or

  Is A has linearly independent columns, must AB have linearly independent columns? If yes, explain why; if not, give an example using 2×2 matrices for which shows that AB can have linearly dependent columns when the columns of A are linearly independent.

- Short calculations: for example, given a small matrix A, row reduce it and state which variables (if any) in the equation $A\boldsymbol{x} = \mathbf{0}$ are free. How do you know which variables are free variables?
  I will try to be sure that all calculations are simple to do by hand.

- State some theorem or parts of theorems, or state a definition: for example,

  Suppose $T : \mathbb{R}^n \to \mathbb{R}^m$ is linear with standard matrix A.
  State two conditions, each one equivalent to the statement that “T is onto”

  or

Give the definition for: $T : \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation

Here's a list of terms (possibly not everything important is in this list, but certainly it contains most of the important items) that you should be able to precisely define:

For a matrix A

echelon form
row reduced echelon form
leading entry
pivot position
pivot column
upper (lower) triangular matrix
diagonal matrix
identity matrix
Inverse matrix A^{-1} (*if it exists*)

For a system of linear equations (such as represented by $A\boldsymbol{x} = \boldsymbol{b}$)

basic variable
free variable
consistent system
homogeneous system
ERO (elementary row operation)

For vectors $\boldsymbol{v_1}, \ldots, \boldsymbol{v_p}$

linear combination
linearly independent/linearly dependent
Span of $\{\boldsymbol{v_1}, \ldots, \boldsymbol{v_p}\}$

Definition of:

Matrix-vector product $A\boldsymbol{x}$ (include the sizes that A, $\boldsymbol{x}$ must have)

AB : What sizes must A, B have for AB to be defined. In that case, what is the definition of AB?

For a function $T : \mathbb{R}^n \to \mathbb{R}^m$

T is linear
T is one-to-one
T is onto
domain of T, range of T, codomain of T
standard matrix for T when T is linear