Topics Covered so Far

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Below is a list of topics considered "fair game" for the upcoming midterm on February 2. A few of these you may have not seen yet but you will by the test date. In a perfect world (for me, not you) I'd have enough time to test you on all of these but for obvious lack of time I have to select concepts I want to focus on. The list below just recaps a lot of what we've covered to help jog your memory and help you study.

1. **Systems of linear equations:** What they are, related vocabulary, geometrical interpretation. Solutions and consistency, *existence/uniqueness* etc. You should also be able to give solutions in a parametric vector form as in, for example, on page 45.

2. **Augmented matrices:** What they are, how to manipulate them via **elementary row operations**. This gave rise to the notion of **equivalence** between systems of linear equations.

3. **Reduction Algorithm:** using the reduction algorithm to produce the **general solution** to a given linear system. This meant learning about **row-echelon** and **reduced row-echelon** form for a matrix.

4. **Pivots:** We learned about pivot position, pivot columns, and pivots. You need to know what they are and how they were used. As well you need to know about **basic variables** and **free variables** and how they are used (as in building **parametric descriptions** of solution sets).

5. **Vectors:** You need to know about vectors in $\mathbb{R}^n$ i.e. what they are and the algabra of manipulating them (as in the table on page 27).

6. **Vector Geometry:** You'll need to know about the **dot product** in $\mathbb{R}^n$ and related ideas like **length** of a vector and about the *angle between two vectors* in $\mathbb{R}^2$ as implicitly determined by the **dot product**. You also need to know about **orthogonality** and related concepts like the **Cauchy** and **Triangle** inequalities, as well as **vector projections**. These things are covered in the TopHat text or in the course notes `http://www.math.toronto.edu/nhoell/MAT223/223_course_notes.pdf`

7. **Matrix-vector product:** If given an $m \times n$ matrix A and an $n \times 1$ vector $\mathbf{x}$ you should know how to compute $A\mathbf{x}$ – both in terms of taking a combination of the columns of A as well as using the dot product of the rows of A with $\mathbf{x}$. You'll need to know when the columns of A span $\mathbb{R}^m$ and how $A\mathbf{x} = \mathbf{b}$ is solved (if solvable).

8. **Homogeneous Systems:** You should know these are consistent. You should know words like **trivial solution** and **nontrivial solution** etc. You should know when they are guaranteed to have infinitely many solutions.

9. **Linear Combinations:** This is a fundamental recurring theme in this course and you need to know what it means.

10. **Spanning:** Given a collection of vectors you need to know what is meant by the **span** of the collection of vectors.