Math 324

Exam 2 will cover section 4.1-4.5,4.7,4.8 and 8.1. Some fundamental topics are listed below:

1. Closure under vector addition, Closure under scalar multiplication.
2. Vector Spaces ($\mathbb{R}^n$, P_n, M_{mn}, $\mathbb{R}^\infty$, $P_\infty = \mathbb{R}[x]$, $F(-\infty, \infty)$, etc.)
3. Subspaces (how to show W is a subspace of V)
4. Geometry of subspaces in $\mathbb{R}^n$.
5. Linear combinations
6. Span
7. Linear Independence/Dependence
8. Basis (you should know the standard basis of $\mathbb{R}^n$, P_n, M_{mn}, but also how to show something is a basis, especially in $\mathbb{R}^n$.)
9. Dimension
10. Finite Dimensional vs. Infinite Dimensional Vector Spaces
11. Coordinate vectors
12. The fundamental subspaces associate to a matrix A: Null(A), Row(A), Col(A), Null(A^T):
    (a) What are they
    (b) How to find a basis for each of these subspaces
    (c) Compute the dimension of each. What is rank(A)? What is nullity(A)?
    (d) Rank-Nullity Theorem
    (e) Orthogonal Complements
    (f) Basis for the Span(S) if $S = \{\mathbf{x}_1, \ldots, \mathbf{x}_n\}$.
    (g) Good idea to see the extended list of Equivalent Statements so far (see page 245), but you do not need to have this memorized.
13. Linear Transformations
    (a) Show $T : V \to W$ is a linear transformation
    (b) If $T : \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation, find the associated matrix $[T]$.
    (c) Find ker(T)
    (d) Find range(T) (the image im(T))
    (e) What is rank(T)? What is nullity(T)?
    (f) Rank-Nullity Theorem