Math 24 Spring 2006 Midterm
Review Guide

Some items to know:

(1) Definition of vector (sub)space, how to tell whether a given set and operations form a vector (sub)space
(2) Result of union or intersection of subspaces
(3) Definition of linear combination, span, generate, linear dependence, linear independence, relationships among these definitions
(4) What linear dependence and independence of one set $S_1 \subset S_2$ tells you about the other set (if anything)
(5) Definition of (ordered) basis; relationship of basis size to size of linearly independent sets and spanning sets, number of representations of a vector of V as linear combinations of its basis vectors
(6) The standard (ordered) bases for the key examples of vector spaces
(7) How to obtain a basis from a spanning set or linearly independent set (in particular, that it can always be done)
(8) Definition of dimension, dimension of subspace
(9) Definition of linear transformation, null space/kernel, range/image (special examples of the identity transformation and zero transformation)
(10) How to tell whether a map $V \to W$ is linear
(11) That $N(T)$ and $R(T)$ are subspaces of V and W, respectively, and the relationship between nullity(T), rank(T), and dim(V) (and that the relationship is only valid for finite-dimensional V)
(12) How to find a spanning set for $R(T)$
(13) The relationship between nullity(T) and whether T is 1-1 (and, if V, W have equal finite dimension, between those and T being onto)
(14) That linear transformations are uniquely determined by what they do to bases of V, and that anything one wants to map the basis elements to gives a linear transformation
(15) How to represent vectors as coordinate vectors and linear transformations as matrices, and use that to find the image of the vector
(16) That the collection of all linear transformations from V to W, $\mathcal{L}(V, W)$, is a vector space whose addition and scalar multiplication correspond neatly to the addition and scalar multiplication of matrices representing linear transformations
(17) How to perform matrix multiplication, and the connection between that and composition of linear transformations (and that both are well-behaved although not commutative)

Do not worry about L_A, which we began at the very end of Friday's class (p. 92-95 of section 2.3 will not be on the midterm). Skip groups and fields. If you need sum, direct sum, Kronecker delta, T-invariance and restriction, projection on W_1 along W_2, or other particular linear transformations which have names in the book but are not mentioned in the list above, they will be given to you.