Linear algebra glossary

Vector space: A vector space V is a nonempty set with addition and scalar multiplication.
The operations must satisfy certain axioms for *arbitrary* vectors u, v, w in V and numbers a, b.

Closure: $u + v$ and au are in V
Commutative: $u + v = v + u$
Associative: $u + (v + w) = (u + v) + w$ and $(ab)u = a(bu)$
Zero: there exists a zero vector 0 such that $u + 0 = u$
Additive inverse: there exists $-u$ such that $u + (-u) = 0$
Distributive: $a(u + v) = au + av$ and $(a + b)u = au + bu$
Unitary: $1u = u$

Superposition principle I: If $v_1, ...v_n$ are vectors in V, then any linear combination $c_1v_1 + ... + c_nv_n$ is in V.

Subspace: A subspace of V is a nonempty subset H of V that is closed under addition and scalar multiplication.

Span: If S is a subset of V, the span of S is the set (in fact, subspace) of all linear combinations of vectors in S.

Linear map: A linear map is a function between vector spaces $T : V \to W$ that preserves addition and scalar multiplication.
Specifically $T(u + v) = T(u) + T(v)$ and $T(au) = aT(u)$.

Superposition principle II: If T is linear, then $T(c_1v_1 + ... + c_nv_n) = c_1T(v_1) + ... + c_nT(v_n)$

Linear independence: A sequence of vectors $v_1, ...v_n$ is linearly independent means that the homogeneous vector equation $c_1v_1 + ... + c_nv_n = 0$ has only the trivial solution $c_1 = ... = c_n = 0$.

Basis: A basis for V is a linearly independent sequence of vectors $v_1, ...v_n$ that spans V.

Dimension: Dimension of V is the (unique) number of elements in any basis for V.

Coordinates: If v is a vector in V and $\mathcal{B} = \{b_1, ...b_n\}$ is a basis for V, the coordinate vector $[v]_{\mathcal{B}}$ consists of the coefficients (weights) $c_1, ...c_n$ of the unique expansion $v = c_1b_1 + ... + c_nb_n$.