Part I (due Friday, March 8 at the beginning of class)

I updated DW 20 reading to not include determinants (I'm sorry—I copied an old example too quickly!); the only change is that we can just row reduce the matrix to see that its rref is I and thus we know the matrix is invertible.

Definition 1. *A nonzero vector space V is called* finite-dimensional *if it contains a finite set of vectors $\{\vec{v}_1, \vec{v}_2, \ldots, \vec{v}_n\}$ that forms a basis for V. If no such set exists, V is called* infinite-dimensional*. We also regard the vector space $\{\vec{0}\}$ as finite-dimensional.*

Example 1.
- finite-dimensional: $\mathbb{R}^n$, $M_{m\times n}$, etc.
- infinite-dimensional: $F(-\infty, \infty)$, $C[a, b]$, etc.

Definition 2. *If V has a basis with n vectors, then we say that V is n-*dimensional.

Reading Question(s)

1. What dimension is the vector space $P_3(x)$? What about $M_{2\times 2}$?

Part II (prepare for Friday, March 8)

Finish the examples on the Bases and Coordinate Vectors handout.

Part III: Homework (due Friday, March 15 at the beginning of class)

1. True or False (if true, prove; if false, give an explained counterexample):
   (a) In P_3, the set of all polynomials of degree three or less with real coefficients, every set with more than three vectors is linearly independent.
   (b) If $\{\vec{v}_1, \vec{v}_2\}$ is linearly independent and $\vec{v}_3 \notin \text{span}(\{\vec{v}_1, \vec{v}_2\})$, then $\{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$ is linearly independent.
   (c) If $\vec{u}$, $\vec{v}$, and $\vec{w}$ are vectors in a vector space V, then $\{\vec{u} - \vec{v}, \vec{v} - \vec{w}, \vec{w} - \vec{u}\}$ is linearly dependent.
   (d) The polynomials $(x - 1)(x + 2)$, $x(x + 2)$, and $x(x - 1)$ are linearly independent.

Running list of vocabulary words that could be a quiz word

- linear equation
- system of linear equations
- linear combination of a set of vectors
- span of a set of vectors

- linearly independent
- linearly dependent
- reduced row echelon form
- pivot
- homogeneous system
- free variable
- row equivalent
- consistent system
- inconsistent system
- trace of a matrix
- transpose of a matrix
- inverse of a matrix
- elementary matrix
- transformation
- domain
- codomain
- range
- vector space (I will not ever ask you to define this on a quiz—the definition is way too long—but you should make sure you know what makes something a vector space)
- subspace