Part I (due Wednesday, April 10 at the beginning of class)

Read Definition 3 on the Kernel and Range handout and find the rank and nullity of the linear transformations in Example 1 on that handout as your reading question.

Part II (prepare for class Wednesday, April 10)

1. Recall that P_4 is the set of all polynomials of degree 4 or less with real coefficients. Consider $D\colon P_4 \to P_4$ such that $D(p) = p'(x)$. Find range, kernel, rank, and nullity.
2. The set P is the set of all polynomials of any degree with real coefficients. Consider $D\colon P \to P$ such that $D(p) = p'(x)$. Find range, kernel, rank, and nullity.

Part III: Homework (due Wednesday, April 10 at the beginning of class)

1. Let V be a vector space and let $T\colon V \to V$ be defined by $T(\vec{v}) = 3\vec{v}$. Describe the kernel and the range of T.
2. Let $T\colon P_1 \to \mathbb{R}$ be the transformation such that $T(\vec{p}) = \displaystyle\int_{-1}^{1} p(x)\,dx$. What is the kernel of T?
3. Bonus: Let V be the space of real-valued functions with continous derivatives of all orders (1st derivative, 2nd derivative, etc.) on the interval $(-\infty, \infty)$ and let $F(-\infty, \infty)$ be the space of all real-valued functions defined on $(-\infty, \infty)$. Find a linear transformation $T\colon V \to F(-\infty, \infty)$ whose kernel is P_3. Make sure to prove that your transformation is linear.

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
- basis
- finite-dimensional vector space
- dimension
- coordinate vector
- column space of A
- row space of A
- null space of A
- rank
- nullity
- linear transformation
- kernel
- range
- isomorphism
- isomorphic vector spaces