Worksheet 3

Due 10/20

- 1. During the October 13th lecture, I wrote down many statements equivalent to "S is a linearly independent set". Do the same for "S is a spanning set". The answer is in the notes but see what you can do from memory.
- 2. Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation. We know that there exists a matrix A such that T(x) = Ax.
- Suppose we know that T(1,0) = (2,3,4) and T(0,1) = (-1,2,1). Can we determine A? If so, what is it? If not, why not?
- Suppose instead we know that T(1,0) = (2,3,4) and T(2,0) = (4,6,8). Can we determine A? If so, what is it? If not, why not?
- Suppose instead we know that T(1,0) = (2,3,4) and T(1,1) = (-1,2,1). Can we determine A? If so, what is it? If not, why not?
- Suppose instead we know that T(x) = u and T(y) = v. Under what conditions on x and y, can we determine A?
- 3. Come up with a linear transform that is:
- One-to-one and onto
- One-to-one but not onto
- Onto but not one-to-one
- Not one-to-one nor onto
- 4. Is differentiation a linear transformation? The answer is yes. I just want you to think about why this is true.
- 5. Do a full exam from the exam archive here under test like conditions.