Math 31AH Fall 2017 Written Homework 7, due **Monday** 11/20/2017 in HW box in the basement of AP&M by 4 pm

1 Reading

Read Section 5.5 in the text and begin reading Section 7.5. In both sections, you are not responsible for proofs and examples that refer to the multivariable calculus we have not covered. In Section 5.5 this is the top half of page 227 and the top half of page 230. In Section 7.5 this is Proposition 5.13 on page 314.

2 Exercises to submit on Monday 11/20

Write out each answer as a careful proof, in full sentences.

Section 4.4: #12, 13, 15, 16, 17

Section 5.5: #11, 16

Remarks: In the definition of projection on page 226, the author seems to take as obvious that if V is a subspace of $\mathbb{R}^n$, then given $\vec{b} \in \mathbb{R}^n$ there exists a unique vector $\vec{p} \in V$ such that $\vec{b} - \vec{p} \in V^\perp$. We will prove this in class on Monday 11/13 in a slightly different but equivalent formulation: we prove there are unique vectors $\vec{p} \in V$, $\vec{x} \in V^\perp$, such that $\vec{b} = \vec{p} + \vec{x}$. You will need to use this result to do Exercise 5.5 #11. Note that in this exercise, you are asked to work directly with the definition of projection and not use the formula for the matrix of a projection given on page 228.

For Exercise 5.5 #11(b), what the author means by "A is a projection matrix" is that there exists a subspace V such that $A = [T]$ is the matrix of the linear transformation T with $T(\vec{x}) = \text{proj}_V \vec{x}$.

3   Additional exercises from the text not to be handed in

These are some other good exercises from these sections if you want to think about more problems for your own practice. Do not hand these in.

Section 4.4: #10, 14, 18

Section 5.5: #10