

Math 110 Homework 4
Due Tuesday July 17, 2018
Covers Material from Axler sections 6.A, 6.B

1. Axler 6.A 4
2. Axler 6.A 6
3. Axler 6.A 12
4. Axler 6.A 31
5. (a) Equip \mathbb{R}^3 with the dot product. Use Gram-Schmidt to find an orthonormal basis for

$$W := \text{Span} \left(\begin{pmatrix} 3 \\ 6 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix} \right).$$

Does the resulting orthonormal basis depend on which vector you pick first?

- (b) Find a basis for W^\perp .
6. (a) Let V be the vector space of real-valued continuous functions on the interval $[0, 1]$. Equip V with the L^2 inner product:

$$\langle f, g \rangle = \int_0^1 f(x)g(x)dx.$$

Find an orthonormal basis for $W := \text{Span}(1, x, x^2) \subset V$.

- (b) What is $\dim(W^\perp)$?
- (c) Consider the restriction of the function $f(x) = x^3$ to $[0, 1]$. What is the projection of f to W ? With the aid of a computer (for example Wolfram Alpha), sketch a graph comparing f with its projection to W .