Math 110

July 12, 2018

Orthogonal Complement

1. (a) Consider $\mathbb{R}^3$ with the usual dot product. Let U be the span of

$$\begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}, \quad \begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}.$$

   Find a basis for $U^{\perp}$.

   (b) Use Gram-Schmidt to turn your basis of $U^{\perp}$ into an orthonormal basis for $U^{\perp}$.

   (c) Find the point on U closest to the vector $(1, 1, 1)$.

2. (a) Consider $\mathbb{R}^3$ with the usual dot product. Let U be the span of

$$\begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}.$$

   Find a basis for $U^{\perp}$.

   (b) Use Gram-Schmidt to turn your basis for $U^{\perp}$ into an orthonormal basis for $U^{\perp}$.

   (c) Find the point on U closest to the vector $(1, 1, 1)$.