Linear algebra, WNE, 2018/2019
meeting 20.

11 December 2018

Problems

1. Consider in $\mathbb{R}^4$ with the standard scalar product the subspaces $V = \{(x,y,z,t)\colon x - y + 4z + 5t = 0\}$ and $W = \text{lin}((1,0,-1,2),(1,1,1,1))$. Find orthonormal bases of $V^\perp$ and $W^\perp$.
2. Check whether in $\mathbb{R}^4$ there exists a vector α, such that $\frac{1}{2}(1,1,1,1), \frac{1}{2}(-1,-1,1,1), \frac{1}{2}(-1,1,-1,1), \alpha$ is an orthonormal basis and the forth coordinate of $(2,4,6,2)$ in this basis equals 3.
3. In $\mathbb{R}^3$, find the orthogonal projection of $\alpha = (1,1,1)$ onto $V = \{(x,y,z)\colon x+2y-z = 0\}$ an the orthogonal projection of this vector onto line $L = \text{lin}((1,2,3))$.
4. Find the image of α from the previous problem under orthogonal reflection across V and under orthogonal reflection across L.
5. In $\mathbb{R}^4$ find the formula for the linear transformation of orthogonal projection onto

$$W = \text{lin}((2,1,0,1),(1,0,0,1))$$

for the linear transformation of orthogonal reflection across W.

Homework

Group 8:00

1. In $\mathbb{R}^4$, find the orthogonal projection of $(4,2,3,1)$ onto subspace $W = \{(x,y,z,t)\colon x+y-z+2t = 0\}$ and the image of $(0,0,1,2)$ under orthogonal reflection across W.
2. Find the formula for the linear transformation $\varphi\colon \mathbb{R}^3 \to \mathbb{R}^3$ of orthogonal projection onto

$$W = \{(x,y,z)\colon x - y + 2z = 0\},$$

and for the linear transformation $\psi\colon \mathbb{R}^3 \to \mathbb{R}^3$ of orthogonal reflection across W.

Group 9:45

1. In $\mathbb{R}^4$, find the orthogonal projection of $(4,2,1,3)$ onto $W = \{(x,y,z,t)\colon x+y+2z-t = 0\}$ and the image of $(0,0,2,1)$ under orthogonal reflection across W.
2. Find a formula for the linear transformation $\varphi\colon \mathbb{R}^3 \to \mathbb{R}^3$ of the orthogonal projection onto

$$W = \{(x,y,z)\colon x + 2y - z = 0\},$$

and of the linear transformation $\psi\colon \mathbb{R}^3 \to \mathbb{R}^3$ of orthogonal reflection across W.