Linear algebra, WNE, 2018/2019
meeting 10.

5 November 2018

Problems

1. Which of the following mappings $\varphi\colon V \to W$ are linear?
   - $V = \mathbb{R}^3, W = \mathbb{R}^2, \varphi((x,y,z)) = (x+3y-1, 4x+2y+6)$,
   - $V = \mathbb{R}^3, W = \mathbb{R}^2, \varphi((x,y,z)) = (x+3y-z, 4x+2y+6z)$,
   - $V = \mathbb{R}^3, W = \mathbb{R}^2, \varphi((x,y,z)) = (x+3y-z, 4|x|+2|y|+6|z|)$,
   - $V = F(\mathbb{R},\mathbb{R}), W = \mathbb{R}, \varphi(f) = 4f(5) - 5f(4)$.
2. For which real numbers $t \in \mathbb{R}$ the mapping $\varphi\colon \mathbb{R}^2 \to \mathbb{R}^2$ such that $\varphi((a,b)) = (a+b+(t^2-9)ab, 5a+3(b-1)+t)$ is linear?
3. Find the formulas for the following linear mappings.
   - $\varphi\colon \mathbb{R}^3 \to \mathbb{R}^3, \varphi((1,0,1)) = (5,1,3), \varphi((0,1,1)) = (2,3,4), \varphi((1,0,0)) = (6,7,7)$,
   - $\varphi\colon \mathbb{R}^2 \to \mathbb{R}^3, \varphi((3,1)) = (4,5,-1), \varphi((7,2)) = (-3,0,5)$.
4. Let $\varphi, \psi\colon \mathbb{R}^3 \to \mathbb{R}^2$, be linear mapping such that $\varphi((1,1,1)) = (3,7)$, $\varphi((1,1,0)) = (2,5)$, $\varphi((1,0,0)) = (1,6)$ and $\psi((2,2,1)) = (3,3), \psi((2,1,0)) = (5,0), \psi((2,1,1)) = (4,2)$. Find the formula for $\varphi+\psi$ and 5φ.

Homework

1. Which of the following mappings $\varphi\colon V \to W$ are linear?
   - $V = \mathbb{R}^2, W = \mathbb{R}^4, \varphi((x,y)) = (2x+6y, 4x+2y, x+y, 3x)$,
   - $V = \mathbb{R}^3, W = \mathbb{R}^2, \varphi((x,y,z)) = ((x+2)^2 - x^2 - z - 4, 4x+2y+6z)$,
2. Let $\varphi, \psi\colon \mathbb{R}^3 \to \mathbb{R}^2$, be linear mappings given as $\varphi((2,2,1)) = (19,12)$, $\varphi((1,1,0)) = (10,0)$, $\varphi((1,0,0)) = (3,1)$ and $\psi((-1,2,1)) = (5,11), \psi((-1,1,0)) = (4,1), \psi((0,0,1)) = (3,9)$. Find the formula for $\varphi+3\psi$.