Definition 1. Let $V, W$ be finite-dimensional vector spaces over a field $\mathbb{F}$, and let $T : V \to W$ be a linear transformation. We call $\dim(Ker(T))$ and $\dim(Im(T))$ the nullity and rank of $T$, respectively.

Definition 1. Let $B = \{v_1, \ldots, v_n\}$ and $C = \{u_1, \ldots, u_n\}$ be two bases for a vector space $V$ over a field $\mathbb{F}$. The matrix of the change of basis from $B$ to $C$, is the unique $M_{C,B} \in M_n(\mathbb{F})$ such that

$$ [v]_C = M_{C,B} \cdot [v]_B,$$

for every $v \in V$.

Formula. The formula for the matrix $M_{C,B}$ defined above, is given by

$$ M_{C,B} = ( [v_1]_C \ldots [v_n]_C ). $$

Definition 2. Let $T : V \to W$ be a linear transformation between finite dimensional vector spaces over a field $\mathbb{F}$. Suppose $B = \{v_1, \ldots, v_n\}$ and $D = \{w_1, \ldots, w_m\}$ are bases for $V$ and $W$, respectively. The matrix representing $T$ with respect to $B$ and $D$, is the unique $[T]_{D,B} \in M_m(\mathbb{F})$ such that

$$ [T(v)]_D = [T]_{D,B} \cdot [v]_B,$$

for every $v \in V$.

Formula. The formula for the matrix $[T]_{D,B}$ defined above, is given by

$$ [T]_{D,B} = ( [T(v_1)]_D \ldots [T(v_n)]_D ). $$

IMPORTANT REMARK In the quiz you will need to repeat exactly what is written here in complete way.

HW5. There will be a random question from HW5.

Good Luck!