

1. Let $V \xrightarrow{T} W$ be a linear transformation. Define

(a) $\ker T$,

(b) $\operatorname{im} T$,

(c) what it means for T to be an *isomorphism*.

2. Let $V \xrightarrow{T} W$ be a linear transformation. True or False? If false, explain why.

(a) If T is an isomorphism then T^{-1} is also a linear transformation.

(b) $\dim \ker T + \dim \operatorname{im} T = \dim W$.

3. Let $V = \{p \in \mathbb{P} \mid \deg p \leq 3\}$, and let $V \xrightarrow{T} V$ denote the *double-differentiation* transformation—i.e., $T(p) = p''$. Do *one* of the following problems.

(a) Find a basis for, and the dimension of, $\ker T$.

(b) Find a basis for, and the dimension of, $\operatorname{im} T$.