Let $T: V \to W$ be a linear map. Show that a) $T(-v) = -T(v)$ b) $T(v - u) = T(v) - T(u)$

Problem Solving - What are the terms/strategies I may need? What do I know?

Definition of a linear map:

$$T(u + v) = T(u) + T(v)$$
$$T(cu) = c(T(u))$$

Properties of vector spaces:

$$-v = (-1)v$$

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Steps & Process – Try to answer the question writing in many steps to avoid small errors.

a) $T(-v)$ $= T(-1v)$ (Property of $-v$)

                              $= -1\, T(v)$ (T is linear)

                              $= -T(v)$ (Property of $-v$)

b) $T(u - v)$ $= T(u + (-v))$ (Definition of vector subtraction)

                              $= T(u) + T(-v)$ (T is linear)

                              $= T(u) + (-T(v))$ (Part a)

                              $= T(u) - T(v)$ (Definition of vector subtraction)

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Solidify Understanding – Explain why the steps makes sense by connecting to math you know.

Why do we consider linear transformations?

For Video Please click the link below:

Video