# MATB24 Quiz1, tut0022

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MATB24 Quiz1,...

MATB24 Quiz.1, TUT.0022

(1) [3 marks] Give a complete definition, or mathematical characterization of the word in bold:

- A **subspace** of a vector space V

W is a subspace of V if $W \subseteq V$ and W is a vector space with same addition and scalar multiplication for V

practical method to verify.

W is subspace of V iff $\vec{0} \in W$, ~~and~~ W is closed under addition and scalar multiplication, $W \subseteq V$.

same from V.

(2) [4 marks] Give an example of a mathematical object that satisfies all the described properties or explain why such an example does not exists.

- An invertible element in a set with a binary operation that has an identity

The invertible element is $0 \in (\mathbb{R}, +)$, where the inverse of 0 is 0, the $0+0=0$

usual addition

identity

① $v=0$ ✓

② $v \neq 0$, $v^{-1}$ ~~exists~~

This will be a 0

(3) [8 marks] Carefully prove the given statement:

- Let V be a vector space. Prove that, if $v \in V$ and r is a scalar and **rv=0**, then either r = 0 or **v** = **0**

WTS $r=0$ or $v=0$

Consider the following cases:

① $r=0$, then we are done. (scalar)

② $r \neq 0$, WTS $v=0$

Known $rV=0$, where v is a scalar in some field corresponding to vector space V (vector)

and since $r \neq 0$, s.t. $r^{-1}$ exists in the field (Every nonzero element in the field has inverse).

$r^{-1}rv = r^{-1} \cdot 0$ (Multiply $r^{-1}$ from the left)

$(r^{-1}r)v = 0$ by associativity.

$1 \cdot v = 0$ by def of inverse.

$v = 0$ by def of identity.

By existence of inverse in F

② for existence of $r^{-1}$

computation ②

Explanation ②