أول ملخص

شروط فضاء Math (V(f), ⊕, ⊙)

1. $r_1 \oplus r_2 \in V \quad \forall r_1, r_2 \in V$
2. $(r_1 \oplus r_2) + r_3 = r_1 \oplus (r_2 \oplus r_3) \quad \forall r_1, r_2, r_3 \in V$
3. [illegible] $\in V$
4. $r \in V \quad \forall r \in V$
5. $r_1 \oplus r_2 = r_2 \oplus r_1 \quad \forall r_1, r_2 \in V$
6. Let $\alpha, \beta \in F$

   $\alpha \odot r \in V \quad \forall r \in V$
7. $(\alpha + \beta) \odot r = \alpha \odot r \oplus \beta \odot r \quad \forall r \in V$
8. $\alpha \odot (r_1 \oplus r_2) = \alpha \odot r_1 + \alpha \odot r_2 \quad r_1, r_2 \in V$
9. $(\alpha \beta) \odot r = \alpha \odot (\beta \odot r) \quad \forall r \in V$
10. $1 \odot r = r \quad \forall r \in V$

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ex 1) $V = \{(x, y, z) : x + y > 0 \quad \forall x, y, z \in V$

Does V be a vector space?

No, why $0 \notin V$

$0 \in V$ معكوس

ex 2) $V = \{(x, y, z) : \forall x \geq, z, x, y \in V$

No, why? $-x \notin V$

Let $r = \{x, y, z\}$ $\pm x \in V$ معكوس

$-r = \{-x, -y, -z\} \Rightarrow -x \leq 0$

$-r \notin V$

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ex 3) $V = \{x, y, z\} : x = z + 1$

$y, z \in R$

V is not a vectors pace, why?

$0 \in V$ ليست ✱

✱ $y = z = 0 \Rightarrow x = 1$

ex 4) $V = \{x, y, z\}$ $x, y, z \in V$

where $(x_1, y_1, z_1) \oplus (x_2, y_2, z_2) =$

$(x_1 + x_2, y_1 - y_2, z_1 + z_2)$ / $\alpha \odot (x, y, z)$

$= (\alpha x, \alpha z, \alpha y)$?

$1 \cdot r \neq r$ موجود $1 \cdot r = r$ مفروض

$y_1 - y_2 \neq y_2 - y_1$ $y_1 + y_2 = y_2 + y_1$ مفروض

Alaziz

ثاني ملخص

Subject: Lect 2 maths 2 22/2/2025

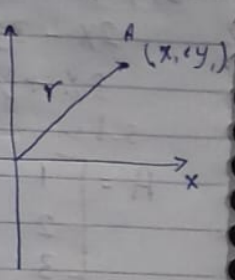
Vector spaces

$\underline{r}_1 = (x_1, x_2, \dots x_n)$

$\underline{r}_2 = (y_1, y_2, \dots y_n)$

* $\underline{r}_1 + \underline{r}_2 = (x_1+y_1, x_2+y_2, \dots x_n+y_n)$.

$\alpha \underline{r}_1 = (\alpha x_1, \alpha x_2, \dots \alpha x_n)$.



$\Rightarrow \underline{0} = (0, 0, 0, \dots, 0)$

Def. vector space.

$(V(F), \oplus, \odot)$

1. $\underline{r}_1 \oplus \underline{r}_2 \in V \quad \forall \underline{r}_1, \underline{r}_2 \in V$ (15)
2. $(\underline{r}_1 \oplus \underline{r}_2) \oplus \underline{r}_3 = \underline{r}_1 \oplus (\underline{r}_2 \oplus \underline{r}_3) \quad \forall \underline{r}_1, \underline{r}_2, \underline{r}_3 \in V$
3. $\underline{0} \in V$
4. $-\underline{r} \in V \quad \forall \underline{r} \in V$
5. $\underline{r}_1 \oplus \underline{r}_2 = \underline{r}_2 \oplus \underline{r}_1 \quad \forall \underline{r}_1, \underline{r}_2 \in V$

Let $\alpha, \beta \in F$

6. $\alpha \odot \underline{r} \in V, \forall \underline{r} \in V$
7. $(\alpha+\beta) \odot \underline{r} = \alpha \odot \underline{r} \oplus \beta \odot \underline{r}, \forall \underline{r} \in V$
8. $\alpha \odot (\underline{r}_1 \oplus \underline{r}_2) = \alpha \odot \underline{r}_1 \oplus \alpha \odot \underline{r}_2, \forall \underline{r}_1, \underline{r}_2 \in V$
9. $(\alpha\beta) \odot \underline{r} = \alpha \odot (\beta \odot \underline{r}) \quad \forall \underline{r} \in V$.
10. $1 \odot \underline{r} = \underline{r}, \forall \underline{r} \in V$.

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EX:- 1) $V=\{(x,y,z): x+y>0, \forall x,y,z \in \mathbb{R}\}$
Does V be a vector space?
Ans:- No, why.
$\underline{0} \notin V$ because $x+y>0 \Rightarrow x=y\neq 0$

2) $V=\{(x,y,z): x\geq 0, x,y,z \in \mathbb{R}\}$
V is not a vector space. why?

Ans:- $-r \in V$ because: Let $r=(x,y,z)\in V$
$\Rightarrow x\geq 0.$
$-r=(-x,-y,-z) \Rightarrow -x\leq 0.$
$\therefore -r \notin V.$

3) $V=\{(x,y,z): x=z+1, y,z\in \mathbb{R}\}$
V is not a vector space, why?

Ans:- $\underline{0}\in V.$
$x=z+1 \Rightarrow z=0 \quad x=1.$

4) $V=\{(x,y,z): x,y,z\in \mathbb{R}\}$ where

$(x_1,y_1,z_1)\oplus(x_2,y_2,z_2)=(x_1+x_2, y_1-y_2, z_1+z_2)$
في الحالات دي بنستبعد الشروط رقم ① ، ⑥
$\alpha \odot (x,y,z)=(\alpha x, \alpha z, \alpha y)$
Ans:- take $\alpha=1 \Rightarrow 1\odot r \neq r.$
$1\odot(x,y,z)=(x,y,z)\neq(x,z,y)$

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Ans 2 let $(x_1, y_1, z_1), (x_2, y_2, z_2) \in V$

$(x_2, y_2, z_2) \oplus (x_1, y_1, z_1) =$

$(x_2 + x_1, y_2 - y_1, z_2 + z_1) \neq (x_1, y_1, z_1) \oplus (x_2, y_2, z_2)$.

Commutative Property is not satisfied.

5] $V = \{(x, y, z) : x = z^2, y, z \in \mathbb{R}\}$.

Ans:- $-\underline{r} \notin V$ because $x = z^2 \not< 0$

6] $V = \{(x, y, z) : x = y + z + 1, y, z \in \mathbb{R}\}$.

Ans:- $\underline{r}_1 = (x, y, z) = (y + z + 1, y, z)$.

$\underline{r}_2 = (a, b, c) = (b + c + 1, b, c)$.

$\underline{r}_1 + \underline{r}_2 = (y + z + b + c + 2, y + b, z + c) \notin V$.

ثالث ملخص

(الأخير)

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lesson 2: Vector spaces.

Def: Any thing that could be defined (numbers, functions...) If it acheives the following conditions.

* نفرض أن x, y, z في V

1- $x+y$ in V

2- $x+(y+z)=(x+y)+z$

3- $x+y=y+x$

4- "0_V" يجب أن يوجد المتجه الصفري

5- for all x in V, there is an object $(-x)$ in V called negative of x such that $x+(-x)=(-x)+x=0$

6- $C \odot x$ should be in V حيث أن C أي عدد صحيح

7- $C \cdot (x+y) = Cx + cy$

8- $(c_1+c_2) \cdot x = c_1x + c_2x$

9- $c_1(c_2x) = c_1c_2x$

10- $x \cdot 1 = x$

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* R → the real numbers
* R^2 → the vectors in 2 diminsions
* R^3 → " " " 3 "

Nawar