Álgebra linear – Avaliação 1

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① $\beta = 9 \qquad \alpha = 1$

$T : \mathbb{R}^3 \to \mathbb{R}^3 \longrightarrow N(t) = [(1,0,2)]$

- $B = \{(1,0,2) ; (1,0,0) ; (0,1,0)\} \subset \mathbb{R}^3$

- $B' = \{(1,0,0) ; (0,1,0) ; (0,0,1)\} \subset \mathbb{R}^3$

$$\begin{cases} T(1,0,2) = (0,0,0) \\ T(1,0,0) = (1,0,0) \\ T(0,1,0) = (0,1,0) \end{cases}$$

$(x,y,z) = a(1,0,2) + b(1,0,0) + c(0,1,0)$

$(x,y,z = (a+b, a+c, a)$

$$\begin{cases} a+b = x \\ a+c = y \\ a = 3 \end{cases} \quad \triangleright \quad \begin{array}{l} b = x - z \\ c = y - x \\ a = z \end{array}$$

$(x,y,z) = 3(1,0,2) + (x-y)(1,0,0) + (y-x)(0,1,0)$

$T(x,y,z) = z(0,0,0) + (x-z)(1,0,0) + (y-x)(0,1,0)$

$T : \mathbb{R}^3 \to \mathbb{R}^3$

$T(x,y,z) = (x-z, y-x, 0) \qquad \triangleright N(T) = [(1,0,2)]$

2)

$T: R^4 \to R^3$

$Im(T) = [(1,0,2) ; (1,-1,1)]$

I) base β para $Im(T) = R^4$

$\beta = \{(1,0,0,0), (0,1,0,0), (0,0,1,0), (0,0,0,1)\}$

$$\begin{cases} T(1,0,0,0) = (1,0,2) \\ T(0,1,0,0) = (1,-1,1) \\ T(0,0,1,0) = (0,0,0) \\ T(0,0,0,1) = (0,0,0) \end{cases}$$

$(x,y,z,t) = x(1,0,0,0) + y(0,1,0,0) + z(0,0,1,0) + t(0,0,0,1)$

$T(x,y,z,t) = x(1,0,2) + y(1,-1,1) + 0 + 0$

$T(x,y,z,t) = x(1,0,2) + y(1,-1,1)$

$T(x,y,z,t) = (x+y, -y, 3z)$

$T: R^4 \to R^3$

$T(x,y,z,t) = (x+y, -y, 3z)$

$Im(T) = [(1,0,2) ; (1,-1,1)]$

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③ $T: P_3(\mathbb{R}) \to P_2(\mathbb{R})$

$\begin{cases} T(1+x) = 2 \\ T(x^3 + x^2) = x^2 + 2x \end{cases}$

$\begin{cases} T(1+x) = 2 \\ x^2 + 2x = 0 \end{cases}$ $\qquad \beta = \{1, x, x^2\} \subset P_3(\mathbb{R})$

$x + yt + zt^2 = x^2 + 2x$

$\underset{\triangleright}{\overset{2}{\curvearrowright}} \boxed{x^3 + 2x^2 + 2x + 2 = 0}$

④ $T: R^3 \to R^3$ $T(x, y, z) = (x, -y, z)$

$$\begin{cases} T(1, 0, 0) = (1, -1, 1) \\ T(0, 0, 1) = (1, -1, 0) \\ T(0, 1, 0) = (1, -1, 1) \end{cases}$$

$$\rightarrow \begin{cases} T^{-1}(1, -1, 1) = (1, 0, 0) \\ T^{-1}(1, -1, 0) = (0, 0, 1) \\ T^{-1}(1, -1, 1) = (0, 1, 0) \end{cases}$$