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1-a) $A+2B=\begin{bmatrix}1 & 0\\2 & 7\end{bmatrix}+2\begin{bmatrix}0 & 5\\3 & -2\end{bmatrix}=\begin{bmatrix}1 & 0\\2 & 7\end{bmatrix}+\begin{bmatrix}0 & 10\\6 & -4\end{bmatrix}=\begin{bmatrix}1 & 10\\8 & 3\end{bmatrix}$

b) $AB-BA=\begin{bmatrix}0 & 5\\21 & -4\end{bmatrix}+\begin{bmatrix}-10 & -35\\+1 & +14\end{bmatrix}=\begin{bmatrix}-10 & -30\\22 & 10\end{bmatrix}$

$AB=\begin{bmatrix}1 & 0\\2 & 7\end{bmatrix}\cdot\begin{bmatrix}0 & 5\\3 & -2\end{bmatrix}=\begin{bmatrix}1.0+0.3 & 1.5+0.(-2)\\2.0+7.3 & 2.5+7.(-2)\end{bmatrix}=\begin{bmatrix}0 & 5\\21 & -4\end{bmatrix}$

$BA=\begin{bmatrix}0 & 5\\3 & -2\end{bmatrix}\cdot\begin{bmatrix}1 & 0\\2 & 7\end{bmatrix}=\begin{bmatrix}0.1+5.2 & 0.0+5.7\\3.1+(-2).2 & 3.0+(-2).7\end{bmatrix}=\begin{bmatrix}10 & 35\\-1 & -14\end{bmatrix}$

c) $2C-D=\begin{bmatrix}-4 & 6 & -14\\14 & -6 & -4\end{bmatrix}+\begin{bmatrix}3 & -2 & 0\\-1 & -1 & -4\\2 & 0 & -2\end{bmatrix}$ Soma não definida, a ordem das matrizes é diferente.

d) $2D^t-3E^t$

$D^t=\begin{bmatrix}-3 & 1 & -2\\2 & 1 & 0\\0 & 4 & 2\end{bmatrix}$ $\quad 2D^t=\begin{bmatrix}-6 & 2 & -4\\4 & 2 & 0\\0 & 8 & 4\end{bmatrix}$

$E^t=\begin{bmatrix}2 & -1 & -6\\4 & 0 & 0\\-3 & -4 & 1\end{bmatrix}$ $\quad 3E^t=\begin{bmatrix}6 & -3 & -18\\12 & 0 & 0\\-9 & -12 & 3\end{bmatrix}$

$2D^t-3E^t=\begin{bmatrix}-6 & 2 & -4\\4 & 2 & 0\\0 & 8 & 4\end{bmatrix}+\begin{bmatrix}-6 & 3 & 18\\-12 & 0 & 0\\9 & 12 & -3\end{bmatrix}=\begin{bmatrix}-12 & 5 & 14\\-8 & 2 & 0\\9 & 20 & 1\end{bmatrix}$

e) $D^2 + DE =$

$$D^2 = \begin{bmatrix} 9 & 4 & 0 \\ 1 & 1 & 16 \\ 4 & 0 & 4 \end{bmatrix}$$

$$DE = \begin{bmatrix} -3 & 2 & 0 \\ 1 & 1 & 4 \\ -2 & 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 2 & 4 & -3 \\ -1 & 0 & -4 \\ -6 & 0 & -1 \end{bmatrix} = \begin{bmatrix} (-3).2+2.(-1)+0.(-6) & (-3).4+2.0+0.0 & (-3).(-3)+2.(-4)+0.(-1) \\ 1.2+1.(-1)+4.(-6) & 1.4+1.0+4.0 & 1.(-3)+1.(-4)+4.(-1) \\ (-2).2+0.(-1)+2.(-6) & (-2).4+0.0+2.0 & (-2).(-3)+0.(-4)+2.(-1) \end{bmatrix}$$

$$DE = \begin{bmatrix} -8 & -12 & 1 \\ -23 & 4 & -11 \\ -16 & -8 & 4 \end{bmatrix} \quad D^2 + DE = \begin{bmatrix} 9 & 4 & 0 \\ 1 & 1 & 16 \\ 4 & 0 & 4 \end{bmatrix} + \begin{bmatrix} -8 & -12 & 1 \\ -23 & 4 & -11 \\ -16 & -8 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -8 & 1 \\ -22 & 5 & 5 \\ -12 & -8 & 8 \end{bmatrix}$$

f) $$C^tA = \begin{bmatrix} -2 & 7 \\ 3 & -3 \\ 7 & -2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 2 & 7 \end{bmatrix} = \begin{bmatrix} (-2).1+7.2 & (-2).0+7.7 \\ 3.1+(-3).2 & 3.0+(-3).7 \\ 7.1+(-2).2 & 7.0+(-2).7 \end{bmatrix} = \begin{bmatrix} 12 & 49 \\ -3 & -21 \\ 3 & -14 \end{bmatrix}$$

g) $$E - AC = \begin{bmatrix} 2 & 4 & -3 \\ -1 & 0 & -4 \\ -6 & 0 & -1 \end{bmatrix} - \begin{bmatrix} -2 & 3 & -7 \\ 45 & -15 & -28 \end{bmatrix}$$ Subtração não definida; a ordem das matrizes é diferente.

$$AC = \begin{bmatrix} 1 & 0 \\ 2 & 7 \end{bmatrix} \cdot \begin{bmatrix} -2 & 3 & -7 \\ 7 & -3 & -2 \end{bmatrix} = \begin{bmatrix} 1.(-2)+0.7 & 1.3+0.(-3) & 1.(-7)+0.(-2) \\ 2.(-2)+7.7 & 2.3+7.(-3) & 2.(-7)+7.(-2) \end{bmatrix} = \begin{bmatrix} -2 & 3 & -7 \\ 45 & -15 & -28 \end{bmatrix}$$

h) $$F^tE = \begin{bmatrix} 1 & -2 & 0 \end{bmatrix} \cdot \begin{bmatrix} 2 & 4 & -3 \\ -1 & 0 & -4 \\ -6 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 1.2+(-2).(-1)+0.(-6) & 1.4+(-2).0+0.0 & 1.(-3)+(-2).(-4)+0.(-1) \end{bmatrix}$$

$$F^tE = \begin{bmatrix} 4 & 4 & 5 \end{bmatrix}$$

$$F^t = \begin{bmatrix} 1 & -2 & 0 \end{bmatrix}$$

i) BCF

$$BC = \begin{bmatrix} 0 & 5 \\ 3 & -2 \end{bmatrix} \cdot \begin{bmatrix} -2 & 3 & -7 \\ 7 & -3 & -2 \end{bmatrix} = \begin{bmatrix} 0.(-2)+5.7 & 0.3+5(-3) & 0.(-7)+5(-2) \\ 3.(-2)+(-2).7 & 3.3+(-2)(-3) & 3.(-7)+(-2).(-2) \end{bmatrix}$$

$$BC = \begin{bmatrix} 35 & -15 & -10 \\ -20 & 15 & -17 \end{bmatrix}$$

$$BCF = \begin{bmatrix} 35 & -15 & -10 \\ -20 & 15 & -17 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix} = \begin{bmatrix} 35.1+(-15)(-2)+(-10).0 \\ (-20).1+15.(-2)+(-17).0 \end{bmatrix}$$

$$BCF = \begin{bmatrix} 65 \\ -50 \end{bmatrix}$$

2- a) $A_{2\times3}\,B_{3\times4} = C_{2\times4}$
BA não está definido

b) $A_{4\times1}\,B_{1\times2} = C_{4\times2}$
BA não está definido

c) $A_{1\times2}\,B_{3\times1}$
O produto AB não está definido.
BA está definido e tem ordem 3×2.

d) $A_{5\times2}\,B_{2\times3} = C_{5\times3}$
BA não está definida

e) $A_{4\times4}\,B_{3\times3}$
AB e BA não estão definidos.

f) $A_{4\times2}\,B_{2\times4} = C_{4\times4}$
BA está definido.

g) $A_{2\times1}\,B_{1\times3} = C_{2\times3}$
BA não está definido

h) $A_{2\times2}\,B_{2\times2} = C_{2\times2}$
BA está definido e tem ordem 2×2.

3-a) $A=(a_{ij})_{2\times 3}$ $\begin{bmatrix} 1 & -1 & -3 \\ 4 & 2 & 0 \end{bmatrix}$

$a_{ij}=3i-2j$

$\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix}$ $a_{11}=1$ $a_{13}=3.1-2.3=-3$ $a_{22}=3.2-2.2=2$

$a_{12}=-1$ $a_{21}=3.2-2.1=4$ $a_{23}=3.2-2.3=0$

b) $B=(b_{ij})_{3\times 3}$ $\begin{bmatrix} 4 & -1 & -2 \\ 3 & 8 & 1 \\ 8 & 7 & 12 \end{bmatrix}$

$\begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$ $b_{11}=4$ $b_{12}=-1$ $b_{13}=1^2-3=-2$ $b_{21}=2^2-1=3$ $b_{22}=3.2+2=8$

$b_{23}=1$ $b_{31}=8$ $b_{32}=7$ $b_{33}=12$

c) $C=(c_{ij})_{1\times 4}$ $\begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix}$

$\begin{bmatrix} c_{11} & c_{12} & c_{13} & c_{14} \end{bmatrix}$ $c_{11}=1^1=1$ $c_{12}=2^1=2$ $c_{13}=3^1=3$ $c_{14}=4^1=4$

d) $D=(d_{ij})_{4\times 4}$ $\begin{bmatrix} 2 & 4 & 6 & 8 \\ 4 & 8 & 12 & 16 \\ 6 & 12 & 18 & 24 \\ 8 & 16 & 24 & 32 \end{bmatrix}$ $\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix}$

i^2+j^2, se $i=j$

$2ij$, se $i\neq j$

$a_{11}=1^2+1^2=2$ $a_{12}=2.1.2=4$ $a_{13}=2.1.3=6$ $a_{14}=2.1.4=8$

$a_{21}=2.2.1=4$ $a_{22}=2^2+2^2=8$ $a_{23}=2.2.3=12$ $a_{24}=2.2.4=16$

$a_{31}=2.3.1=6$ $a_{32}=2.3.2=12$ $a_{33}=3^2+3^2=18$ $a_{34}=2.3.4=24$

$a_{41}=2.4.1=8$ $a_{42}=2.2.4=16$ $a_{43}=2.4.3=24$ $a_{44}=4^2+4^2=32$

4-a) $[BA]_{23}=20$

$[BA]_{23}=(2.1)+(-1.2)+(4.5)=2-2+20=20$

b) $[AB]_{23}=-32$

$[AB]_{23}=(-2.3)+(-3.4)+(2.-7)=-6-12-14=-32$

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c) $[B^2]_{31} = 16$

$[B^2]_{31} = (-3.1) + (-1.2) + (-7.-3) = -3 - 2 + 21 = 16$

d) $tr(A) = a_{11} + a_{22} + a_{33} = 3$

$tr(A) = 1 + (-3) + 5 = 3$

e) $tr(B^t) = [B^t]_{11} + [B^t]_{22} + [B^t]_{33} = -7$

$tr(B^T) = 1 + (-1) + (-7) = -7$

f) $tr(A-B) = [A-B]_{11} + [A-B]_{22} + [A-B]_{33} = 10$

$$A - B = \begin{bmatrix} 1-1 & 2-0 & 1-3 \\ -2-2 & -3-(-1) & 2-4 \\ 1-(-3) & 4-(-1) & 5-(-7) \end{bmatrix} = \begin{bmatrix} 0 & 2 & -2 \\ -4 & -2 & -2 \\ 4 & 5 & 12 \end{bmatrix}$$

$tr(A-B) = [A-B]_{11} + [A-B]_{22} + [A-B]_{33}$

$tr(A-B) = 0 + (-2) + 12 = 10$

$tr(A-B) = 10$

g) $tr(AB) = [AB]_{11} + [AB]_{22} + [AB]_{33} = -13$

$[AB]_{11} = (1.1) + (2.2) + (1.-3) = 1 + 4 - 3 = 2$

$tr(AB) = 2 + 1 + (-16) = -13$

$[AB]_{22} = (-2.0) + (3.-1) + (2.-1) = 0 + 3 - 2 = 1$

$[AB]_{33} = (1.3) + (4.4) + (5.-7) = 3 + 16 - 35 = -16$

5- a) $2X + A = 3B + C$

$$X = \begin{bmatrix} 7/2 & -1 \\ 11/2 & 3/2 \end{bmatrix}$$

$$3B = 3\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} \to 3B = \begin{bmatrix} 6 & 3 \\ 12 & 9 \end{bmatrix}$$

$$3B + C = \begin{bmatrix} 6 & 3 \\ 12 & 9 \end{bmatrix} + \begin{bmatrix} 0 & 2 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 6 & 5 \\ 13 & 9 \end{bmatrix}$$

$2X = 3B + C - A$

$$2X = \begin{bmatrix} 6 & 5 \\ 13 & 9 \end{bmatrix} - \begin{bmatrix} -1 & 7 \\ 2 & 6 \end{bmatrix} \to 2X = \begin{bmatrix} 7 & -2 \\ 11 & 3 \end{bmatrix}$$

$$X = \begin{bmatrix} 7/2 & -2/2 \\ 11/2 & 3/2 \end{bmatrix} \qquad X = \begin{bmatrix} 7/2 & -1 \\ 11/2 & 3/2 \end{bmatrix}$$

b) $Y + A = \frac{1}{2}(B-C)^t \rightarrow Y = \begin{bmatrix} 2 & -11/2 \\ -5/2 & -9/2 \end{bmatrix}$

$B - C = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} - \begin{bmatrix} 0 & 2 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 3 & 3 \end{bmatrix} \quad (B-C)^T = \begin{bmatrix} 2 & 3 \\ -1 & 3 \end{bmatrix}$

$\frac{1}{2} \cdot (B-C)^T = \begin{bmatrix} 1 & \frac{3}{2} \\ -\frac{1}{2} & 3/2 \end{bmatrix} \quad Y = \begin{bmatrix} 1 & 3/2 \\ -1/2 & 3/2 \end{bmatrix} - \begin{bmatrix} -1 & 7 \\ 2 & 6 \end{bmatrix} = \begin{bmatrix} 2 & -11/2 \\ -5/2 & -9/2 \end{bmatrix}$

c) $3X + A = B - X \rightarrow X = \begin{bmatrix} 3/4 & -3/2 \\ 1/2 & -3/4 \end{bmatrix}$

$3X + X = B - A$

$4X = BA$

$B - A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} - \begin{bmatrix} -1 & 7 \\ 2 & 6 \end{bmatrix} = \begin{bmatrix} 3 & -6 \\ 2 & -3 \end{bmatrix} \quad X = \frac{1}{4} \cdot \begin{bmatrix} 3 & -6 \\ 2 & -3 \end{bmatrix} \quad X = \begin{bmatrix} 3/4 & -3/2 \\ 1/2 & -3/4 \end{bmatrix}$

d) $\begin{cases} X + Y = 3A \\ X - Y = 2B + C \end{cases} \rightarrow X = \begin{bmatrix} 1/2 & 25/2 \\ 15/2 & 12 \end{bmatrix}; Y = \begin{bmatrix} -7/2 & 17/2 \\ -3/2 & 6 \end{bmatrix}$

$3A = \begin{bmatrix} -3 & 21 \\ 6 & 18 \end{bmatrix} \quad 2B = \begin{bmatrix} 4 & 2 \\ 8 & 6 \end{bmatrix} \quad 2B + C = \begin{bmatrix} 4 & 2 \\ 8 & 6 \end{bmatrix} + \begin{bmatrix} 0 & 2 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 4 & 4 \\ 9 & 6 \end{bmatrix}$

$\begin{cases} X + \cancel{Y} = 3A \\ X - \cancel{Y} = 2B + C \end{cases} \quad 2X = 3A + (2B + C) \rightarrow 2X = \begin{bmatrix} -3 & 21 \\ 6 & 18 \end{bmatrix} + \begin{bmatrix} 4 & 4 \\ 9 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 25 \\ 15 & 24 \end{bmatrix}$

$2X = 3A + (2B + C) \quad X = \begin{bmatrix} 1/2 & 25/2 \\ 15/2 & 12 \end{bmatrix} //$

$Y = 3A - X \rightarrow Y = \begin{bmatrix} -3 & 21 \\ 6 & 18 \end{bmatrix} - \begin{bmatrix} 1/2 & \frac{25}{2} \\ 15/2 & 12 \end{bmatrix} \rightarrow Y = \begin{bmatrix} -7/2 & \frac{17}{2} \\ -3/2 & 6 \end{bmatrix} //$

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$$6)\ A^2 = \begin{bmatrix} 1 & \frac{1}{x} \\ x & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & \frac{1}{x} \\ x & 1 \end{bmatrix} = \begin{bmatrix} 1.1+\frac{1}{x}.x & 1.\frac{1}{x}+\frac{1}{x}.1 \\ x.1+1.x & x.\frac{1}{x}+1.1 \end{bmatrix} = \begin{bmatrix} 2 & \frac{2}{x} \\ 2x & 2 \end{bmatrix}$$

$$2A = \begin{bmatrix} 2 & \frac{2}{x} \\ 2x & 2 \end{bmatrix} \therefore A^2 = 2A \to \begin{bmatrix} 2 & \frac{2}{x} \\ 2x & 2 \end{bmatrix} = \begin{bmatrix} 2 & \frac{2}{x} \\ 2x & 2 \end{bmatrix}$$

$A^2 = 2A \therefore A^3 = A^2 . A = (2A).A = 2(A.A) = 2A^2$

$A^3 = 2.(2A) = 4A$

$A^4 = A^3 . A = (4A).A = 4A^2$ $\qquad A^n = 2^{n-1}A$, para $n \geq 1$

$A^4 = 4(2A) = 8A$

7- a) $A(B+C) = X+Y$

$A(B+C) = AB + AC = X+Y$

b) $(B^T A^T) = X^T$

$(BA)^T = A^T B^T \to B^T A^T = (AB)^T \to (AB)^T = (X)^T$

c) $C^T A^T = Y^T$

$(CA)^T = A^T C^T \Rightarrow C^T A^T = (AC)^T = Y^T$

d) $(ABA)C = XY$

$(ABA)C = (XA)C \to X(AC) \to XY$

8- a) $x = 5$ e $A = \begin{bmatrix} 4 & 7 \\ 7 & 6 \end{bmatrix}$

$A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ $\quad A^T = \begin{bmatrix} 4 & 2x-3 \\ x+2 & x+1 \end{bmatrix}$ $\quad x+2 = 2x+3$

$5 = 2x - x$

$x = 5$

$A = \begin{bmatrix} 4 & 5+2 \\ 2.5-3 & 5+1 \end{bmatrix} \to A = \begin{bmatrix} 4 & 7 \\ 7 & 6 \end{bmatrix}$

b) $x = 4$, $y = -2$ e $z = -\frac{1}{3}$

$$B = \begin{bmatrix} 0 & -4 & 2 \\ x & 0 & 1-z \\ y & 2z & 0 \end{bmatrix} \qquad B^T = -B \rightarrow \begin{bmatrix} 0 & x & y \\ -4 & 0 & 2z \\ 2 & 1-z & 0 \end{bmatrix} = \begin{bmatrix} 0 & 4 & -2 \\ -x & 0 & -(1-z) \\ -y & -2z & 0 \end{bmatrix}$$

$-x = -4 \rightarrow x = 4$ $\qquad$ $2z = -(1-z)$

$-y = 2 \rightarrow y = -2$ $\qquad$ $2z + z = -1$

$z = -\frac{1}{3}$ $\qquad$ $z = -\frac{1}{3}$

9) $x = 2$; $y = 4$; $z = 1$ e $t = 3$.

$$3\begin{pmatrix} x & y \\ z & t \end{pmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2t \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+t & 3 \end{bmatrix} \rightarrow \begin{bmatrix} 3x & 3y \\ 3z & 3t \end{bmatrix} = \begin{bmatrix} x+4 & 6+x+y \\ -1+z+t & 2t+3 \end{bmatrix}$$

$3x = x + 4$	$3y = 6 + x + y$	$3z = -1 + z + t$	$3t = 2t + 3$
$2x = 4$	$3y - y = 6 + 2$	$2z + 1 = t$	$t = 3$
$x = 2$	$2y = 8$	$2z + 1 = 3$	
	$y = 4$	$2z = 2 \rightarrow z = 1$	

10 - a) $R(\theta) = \begin{bmatrix} \cos\theta & \operatorname{sen}\theta \\ -\operatorname{sen}\theta & \cos\theta \end{bmatrix}$ $\qquad$ $R(\theta)R^T(\theta) = I_2$

$R^T(\theta)$ $\begin{bmatrix} \cos\theta & -\operatorname{sen}\theta \\ \operatorname{sen}\theta & \cos\theta \end{bmatrix}$

$$R(\theta)R^T(\theta) = \begin{bmatrix} \cos\theta & \operatorname{sen}\theta \\ -\operatorname{sen}\theta & \cos\theta \end{bmatrix} \cdot \begin{bmatrix} \cos\theta & -\operatorname{sen}\theta \\ \operatorname{sen}\theta & \cos\theta \end{bmatrix}$$

$\downarrow$

$$\begin{bmatrix} \cos\theta.\cos\theta + \operatorname{sen}\theta.\operatorname{sen}\theta & \cos\theta.(-\operatorname{sen}\theta) + \operatorname{sen}\theta.\cos\theta \\ (-\operatorname{sen}\theta).\cos\theta + \cos\theta.\operatorname{sen}\theta & (-\operatorname{sen}\theta).(-\operatorname{sen}\theta) + \cos\theta.\cos\theta \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$R(\theta)R^T(\theta) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I_2$, portanto, $R(\theta)$ é uma matriz ortogonal.

b) $A=\begin{bmatrix} 1 & 0 & x \\ 0 & \frac{1}{\sqrt{2}} & y \\ 0 & \frac{1}{\sqrt{2}} & z \end{bmatrix}$ $A^T=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/\sqrt{2} & 1/\sqrt{2} \\ x & y & z \end{bmatrix}$

$$AA^T=\begin{bmatrix} 1.1+0.0+xx & 1.0+0.\frac{1}{\sqrt{2}}+xy & 1.0+0.\frac{1}{\sqrt{2}}+xz \\ 0.1+\frac{1}{\sqrt{2}}.0+yx & 0.0+\frac{1}{\sqrt{2}}\cdot\frac{1}{\sqrt{2}}+yy & 0.0+\frac{1}{\sqrt{2}}\cdot\frac{1}{\sqrt{2}}+yz \\ 0.1+\frac{1}{\sqrt{2}}.0+zx & 0.0+\frac{1}{\sqrt{2}}\cdot\frac{1}{\sqrt{2}}+zy & 0.0+\frac{1}{\sqrt{2}}\cdot\frac{1}{\sqrt{2}}+zz \end{bmatrix}$$

$$AA^T=\begin{bmatrix} x^2+1 & xy & xz \\ xy & \frac{1}{2}+y^2 & \frac{1}{2}+yz \\ xz & \frac{1}{2}+yz & \frac{1}{2}+z^2 \end{bmatrix}=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$1+x^2=1$ $\quad xy=0$ $\quad \frac{1}{2}+y^2=1$ $\quad \frac{1}{2}+yz=0$ $\quad \frac{1}{2}+z^2=1$

$x^2=0$ $\quad xz=0$ $\quad y^2=\frac{1}{2}$ $\quad yz=-\frac{1}{2}$ $\quad z^2=\frac{1}{2}$

$x=0$ $\quad y=\pm\frac{1}{\sqrt{2}}$ $\quad z=\pm\frac{1}{\sqrt{2}}$

Os possíveis valores são: $x=0$; $y=\frac{1}{\sqrt{2}}$, $z=-\frac{1}{\sqrt{2}}$ ou $y=-\frac{1}{\sqrt{2}}$, $z=\frac{1}{\sqrt{2}}$.