Linear Algebra (1):

$$A = \begin{bmatrix} 1 & 0 & -1 & 2 \\ 0 & 3 & 1 & -1 \\ 2 & 4 & 0 & 3 \\ 3 & 1 & -1 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 2 \\ 3 & -1 \\ 0 & -2 \\ 4 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 3 & -2 & 0 & 5 \\ 1 & 0 & -3 & 4 \end{bmatrix}$$

4×4 $\quad$ 4×2 $\quad$ 2×4

(a) $D = ABC$? $(4\times4)(4\times2)(2\times4)$ ✓ $d_{3,4}$?

$d_{3,4} = \text{dot}(AB(3,:), C(:,4))$

$AB(3,:) = A(3,:) * B$

$AB(3,:) = [26 \quad 3]$

$[26 \quad 3] \cdot [5 \quad 4] = \underline{142} = d_{3,4}$

(b) $E = BAC$? $(4\times\cancel{2})(\cancel{4\times4})(2\times4)$ no

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(c) $F = BCA$? $(4\times2)(2\times4)(4\times4)$ ✓ $f_{4,3}$?

$f_{4,3} = \text{dot}(BC(4,:), A(:,3))$

$BC(4,:) = B(4,:) * C$

$BC(4,:) = [13 \quad -8 \quad -3 \quad 24]$

$[13 \quad -8 \quad -3 \quad 24] \cdot [-1 \quad 1 \quad 0 \quad -1]$

$-13 - 8 - 24 = \underline{-45} = f_{4,3}$

(d) $G = ACB$? $(4\times\cancel{4})(\cancel{2\times4})(4\times2)$ no

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(e) $H = CAB$? $(2\times4)(4\times4)(4\times2)$ ✓ $h_{2,1}$?

$h_{2,1} = \text{dot}(CA(2,:), B(:,1))$

$CA(2,:) = C(2,:) * A$

$CA(2,:) = [-17 \quad -8 \quad -5 \quad 1]$

$[-17 \quad -8 \quad -5 \quad -1] \cdot [1 \quad 3 \quad 0 \quad 4]$

$-17 - 24 - 4 = \underline{-37} = h_{2,1}$

(f) $J = CBA$ no

$(2\times4)(4\times\cancel{2})(4\times4)$

Linear Algebra (3)

$A = \begin{bmatrix} 1 & 1/3 \\ c & d \end{bmatrix}$ Find c, d s.t. $A^2 = -I$

$$\begin{bmatrix} 1 & 1/3 \\ c & d \end{bmatrix}\begin{bmatrix} 1 & 1/3 \\ c & d \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

$1 + \frac{1}{3}c = -1 \rightarrow c = -6$

$\frac{1}{3} + \frac{1}{3}d = 0 \rightarrow d = -1$