Part 3 - Matrices

(1) $\begin{bmatrix} 5\cdot 2 & 5\cdot 4 \\ 5\cdot -1 & 5\cdot a \end{bmatrix} + \begin{bmatrix} -4 & c \\ b & 3 \end{bmatrix} = \begin{bmatrix} d & 0 \\ 1 & 6 \end{bmatrix}$

$\begin{bmatrix} 10-4 & 20+c \\ -5+b & 5a+3 \end{bmatrix} = \begin{bmatrix} d & 0 \\ 1 & 6 \end{bmatrix}$

$6 = d$

$20+c = 0 \Rightarrow c = -20$

$-5+b = 1 \Rightarrow b = 6$

$5a+3 = 6 \Rightarrow 5a = 3 \Rightarrow a = 3/5 = .6$

$= B\begin{pmatrix} B & L & D \\ 3 & 6 & 10 \end{pmatrix}$ $= \begin{matrix} \$ \\ B \\ L \\ D \end{matrix}\begin{pmatrix} 3 \\ 6 \\ 10 \end{pmatrix}$

(2) A is 3x3 B_1 is 1x3 and B_2 is 3x1

R wrel have 3 pieces of unformation (ave $ for each rest)

$A \cdot B_1$ is $(3\times3)\cdot(1\times3)$ DNE

$B_1 \cdot A$ is $(1\times3)\cdot(3\times3) = (1\times3)$ maybe

$A \cdot B_2$ is $(3\times3)\cdot(3\times1) = (3\times1)$ maybe

$B_2 A$ is $(3\times1)\cdot(3\times3)$ DNE

$$A \cdot B_2 = \begin{matrix} & \text{I} & \text{II} & \text{III} \\ B \\ L \\ D \end{matrix}\begin{pmatrix} 66 & 300 & 250 \\ & & \\ & & \end{pmatrix} \begin{matrix} & \$ \\ B & \\ L & \\ D & \end{matrix}\begin{pmatrix} 3 \\ 6 \\ 10 \end{pmatrix}$$ meaningless

$$B_1 A = \begin{matrix} & B & L & D \\ \$ \end{matrix}\begin{pmatrix} 3 & 6 & 10 \end{pmatrix} \begin{matrix} & \text{I} & \text{II} & \text{III} \\ B & & & \\ L & & & \\ D & & & \end{matrix}\begin{pmatrix} 66 & & \\ 150 & & \\ 50 & & \end{pmatrix}$$

$$= \begin{matrix} & \text{I} & \text{II} & \text{III} \\ \$ \end{matrix}\begin{pmatrix} 1598 & 8100 & 5350 \end{pmatrix}$$

③ $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \end{bmatrix} \rightarrow \begin{bmatrix} 1x+3y \\ 2x-y \end{bmatrix} \Rightarrow \begin{matrix} x+3y=4 \\ 2x-y=0 \end{matrix}$

④ YX is $(3\times1)\cdot(4\times3)$ and DNE

$$XY = \begin{matrix} \\ \text{meat} \\ \text{fruit} \\ \text{grain} \\ \text{dairy} \end{matrix}\begin{matrix} \begin{matrix} \text{fat} & \text{carb} & \text{pro} \end{matrix} \\ \begin{pmatrix} 5 & 0 & 7 \\ 0 & 10 & 1 \\ 0 & 15 & 2 \\ 10 & 12 & 8 \end{pmatrix} \end{matrix} \cdot \begin{matrix} \\ \text{fat} \\ \text{carb} \\ \text{pro} \end{matrix}\begin{matrix} \begin{matrix} \text{cal} \end{matrix} \\ \begin{pmatrix} 8 \\ 4 \\ 5 \end{pmatrix} \end{matrix}$$

$$= \begin{matrix} \\ \text{meat} \\ \text{fruit} \\ \text{grain} \\ \text{dairy} \end{matrix}\begin{matrix} \begin{matrix} \text{cal} \end{matrix} \\ \begin{pmatrix} 5\cdot8+0\cdot4+7\cdot5 \\ 0\cdot8+10\cdot4+1\cdot5 \\ 0\cdot8+15\cdot4+2\cdot5 \\ 10\cdot8+12\cdot4+8\cdot5 \end{pmatrix} \end{matrix} \begin{matrix} \\ =75 \\ =45 \\ =70 \\ =168 \end{matrix}$$

= total cal from fat, carb and protein in one "unit" of each food

⑤ a) $A+D$ is $(4\times4)+(2\times4)$ DNE dim mismatch
b) $A+B$ is $(4\times4)+(4\times4)$ is a (4×4)
c) $C+D^T$ is $(4\times2)+(4\times2)$ is a (4×2)
d) BI is $(4\times4)\cdot(4\times4)$ is a 4×4
e) B^{-1} DNE as B is singular (no inverse)
f) A^{-1} is 4×4
g) AC is $(4\times4)(4\times2)$ is a 4×2
h) D^2 is $(2\times4)\cdot(2\times4)$ DNE dim mismatch
i) B^2 is $(4\times4)\cdot(4\times4)$ is a 4×4
j) CD is $(4\times2)\cdot(2\times4)$ is a 4×4

6. $AX + X = D$

$AX + IX = D$

$(A + I)X = D$

$(A+I)^{-1}(A+I)X = (A+I)^{-1}D$

$IX = (A+I)^{-1}D$

$X = (A+I)^{-1}D$

$XA + X = D$

$XA + XI = D$

$X(A+I) = D$

$X(A+I)(A+I)^{-1} = D(A+I)^{-1}$

$XI = D(A+I)^{-1}$

$X = D(A+I)^{-1}$