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### PROBLEM #1

Calculate  $C_{21} = A_{2j}B_{j1}$

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

Einstein Conv  $\rightarrow$  sum over repeated indices

$$C_{21} = a_{21}b_{11} + a_{22}b_{21} + a_{23}b_{31}$$

$$= (4)(1) + (0)(0) + (1)(1)$$

$$= 5$$

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### PROBLEM #2

What is  $C = AB$ ?

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

=  $AB$

$$= \begin{bmatrix} 1 & 3 & 5 \\ 5 & 4 & 1 \end{bmatrix}$$

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### PROBLEM #3

$$\text{Calc } [2 \ 4 \ 5 \ 6] \begin{bmatrix} 1 \\ 3 \\ 2 \\ 1 \end{bmatrix} = (2)(1) + (4)(3) + (5)(2) + (6)(1)$$

$$= 2 + 12 + 10 + 6$$

$$= 30$$

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### PROBLEM #4

$$\text{Calc } \begin{bmatrix} 1 \\ 3 \\ 2 \\ 1 \end{bmatrix} [2 \ 4 \ 5 \ 6] = \begin{bmatrix} 2 & 4 & 5 & 6 \\ 6 & 12 & 15 & 18 \\ 4 & 8 & 10 & 12 \\ 2 & 4 & 5 & 6 \end{bmatrix}$$

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### PROBLEM #5

Calc  $\begin{bmatrix} 2 & -1 \\ 0 & 3 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 0 & 1 & 4 & -1 \\ -2 & 0 & 0 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 2 & 8 & -4 \\ -6 & 0 & 0 & 6 \\ 0 & 1 & 4 & -1 \end{bmatrix}$

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### PROBLEM #6.

What is  $\dim(D)$ ?

$$D = \underbrace{A_{3 \times 3}}_{B_{3 \times 7}} \underbrace{C_{4 \times 4}}$$

$$\dim(D) = (5, 4)$$

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### PROBLEM #7

Calc Prod.

$$\begin{aligned} &= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \\ &= \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \end{aligned}$$

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### PROBLEM #8

What is the dot of u and v. vectors?

$\sum_{i=1}^n u_i v_i$

$u \cdot v$

$[u_1 \ u_2 \dots \ u_n] \begin{bmatrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{bmatrix}$

$u_i v_j$

$u_i v_i$

$\begin{bmatrix} u_1 \\ u_2 \\ \vdots \end{bmatrix} \begin{bmatrix} v_1 \ v_2 \ \dots \ v_n \end{bmatrix}$