## 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 → sum over repeated indices

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

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

$$= 5$$

## PROBLEM #2

What is $C = AB$?

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

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

## PROBLEM #3

Calc $\begin{bmatrix} 2 & 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 \\ 3 \\ 2 \\ 1 \end{bmatrix}$

$$= (2)(1) + (4)(3) + (5)(2) + (6)(1)$$

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

$$= 30$$

## PROBLEM #4

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

## PROBLEM #5

Calc

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

## PROBLEM #6.

What is dim(D)?

$$D = A_{5 \times 3} \underbrace{B_{3 \times 7}} \underbrace{C_{4 \times 4}}$$

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

## PROBLEM #7

Calc Prod.

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

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

## PROBLEM #8

What is the dot of u and v. vectors?

- ☑ $\sum_{i=1}^{n} u_i v_i$

- ☑ $\begin{bmatrix} u_1 & u_2 & \dots & u_n \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{bmatrix}$

- ☑ $u_i v_i$

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

- ☑ $u \cdot v$

- ☐ $u_i v_j$