

①

$$(a_1, \dots, a_n) \cdot (b_1, \dots, b_n) = a_1 b_1 + \dots + a_n b_n$$

$$\begin{aligned} \text{eg. } (2, 3, 4) \cdot (5, 6, 7) &= 2 \cdot 5 + 3 \cdot 6 + 4 \cdot 7 \\ &= 10 + 18 + 28 = 56 \end{aligned}$$

TOP ↑

BOTTOM ↓

$$2 \times 3 \text{ matrix: } A = \begin{bmatrix} 3 & 5 & 7 \\ 16 & 17 & 18 \end{bmatrix}$$

$$L_A: \mathbb{R}^3 \rightarrow \mathbb{R}^2$$

$$L_A(x, y, z) = (3x + 5y + 7z, 16x + 17y + 18z)$$

$$B = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 31 & 32 & 33 & 34 & 35 & 36 \\ 71 & 72 & 73 & 74 & 75 & 76 \end{bmatrix}$$

$$\begin{aligned} L_B(u, v, w, x, y, z) &= (u + 2v + 3w + 4x + 5y + 6z, \\ &31u + 32v + 33w + 34x + 35y + 36z, \\ &71u + 72v + 73w + 74x + 75y + 76z) \end{aligned}$$

$$C = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 6 & 7 \end{bmatrix}$$

$$p = (100, 200)$$

$$L_c(p) = \left(\begin{array}{l} (2, 3) \cdot (100, 200), \\ (4, 5) \cdot (100, 200), \\ (6, 7) \cdot (100, 200) \end{array} \right)$$

$$= (800, 1400, 2000)$$

TOP ↑

BOTTOM ↓

$$\begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} 100 \\ 200 \end{bmatrix} = \begin{bmatrix} 800 \\ 1400 \\ 2000 \end{bmatrix}$$

3

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 47 & 57 & 67 & 77 \\ 48 & 58 & 68 & 78 \\ 49 & 59 & 69 & 79 \end{bmatrix} = ?$$

2x3

3x4

2x4

(1,3) entry of ? is

$$\begin{aligned} & (1,2,3) \cdot (67,68,69) \\ &= 1 \cdot 67 + 2 \cdot 68 + 3 \cdot 69 \\ &= 67 + 136 + 207 = 410 \end{aligned}$$

$$? = \begin{bmatrix} | & | & 410 & | \end{bmatrix}$$

Exercise: Fill in the rest