

Method I

$$A^{-1} = \frac{1}{|A|} \begin{bmatrix} a & d \\ c & b \end{bmatrix}$$

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

$$|A| = 4 - 6 \\ = -2$$

$$A^{-1} = \frac{1}{|A|} \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$$

$$= -\frac{1}{2} \begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$$

Method II

Row Operations

$$\xrightarrow{+\frac{1}{2}} \left[ \begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 3 & 4 & 0 & 1 \end{array} \right]$$

$$-2 \left[ \begin{array}{cc|cc} -\frac{1}{2} & 0 & 1 & -\frac{1}{2} \\ 3 & 4 & 0 & 1 \end{array} \right]$$

$$\xrightarrow{+3} \left[ \begin{array}{cc|cc} 1 & 0 & -2 & 1 \\ 3 & 4 & 0 & 1 \end{array} \right]$$

$$\frac{1}{4} \left[ \begin{array}{cc|cc} 1 & 0 & -2 & 1 \\ 0 & 4 & 6 & -2 \end{array} \right]$$

$$\left[ \begin{array}{cc|cc} 1 & 0 & -2 & 1 \\ 0 & 1 & \frac{3}{2} & -\frac{1}{2} \end{array} \right]$$

$$A^{-1} = \begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$$

Finding  $A^{-1}$  from  $A$ .

Method II works for any  $N \times N$  matrix.

-WF