# Find Inverse of Matrix

#### 2 X 2 Matrix

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \qquad A^{-1} = \begin{bmatrix} e & f \\ g & h \end{bmatrix} \qquad \text{Find } e, f, g, h$$
$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} e & f \\ g & h \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$
$$A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

If ad - bc = 0, A is not invertible.

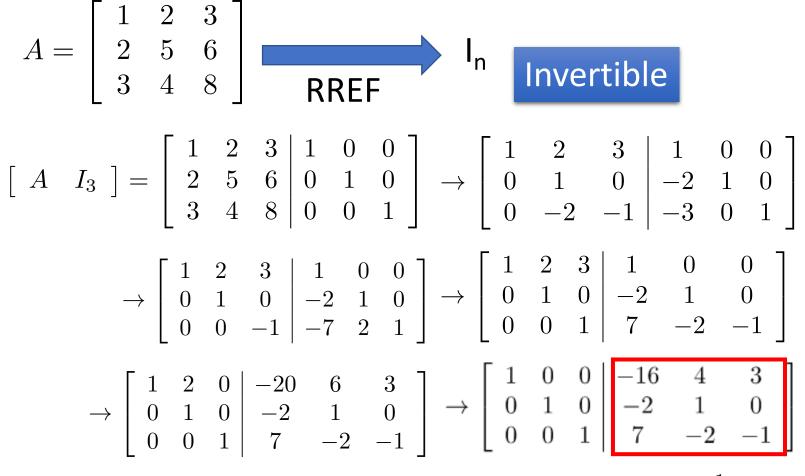
 Let A be an n x n matrix. A is invertible if and only if the reduced row echelon form of A is In

$$\frac{E_k \cdots E_2 E_1 A}{A^{-1}} = R = I_n$$

$$A^{-1} = E_k \cdots E_2 E_1$$

- Let A be an n x n matrix. Transform [ A I<sub>n</sub> ] into its RREF [ R B ]
  - R is the RREF of A
  - B is a nxn matrix (not RREF)
- If  $R = I_n$ , then A is invertible
  - B = A<sup>-1</sup>

$$E_k \cdots E_2 E_1 \begin{bmatrix} A & I_n \end{bmatrix}$$
$$= \begin{bmatrix} R & E_k \cdots E_2 E_1 \end{bmatrix}$$
$$I_n \qquad A^{-1}$$



 $A^{-1}$ 

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  - B = A<sup>-1</sup>
- To find A<sup>-1</sup>C, transform [ A C ] into its RREF [ R C' ]

$$E_k \cdots E_2 E_1 \begin{bmatrix} A & C \end{bmatrix} = \begin{bmatrix} R & E_k \cdots E_2 E_1 C \end{bmatrix}$$
$$I_n \qquad A^{-1}$$

 $A^{-1}C$