

- ⑤ 1. Given that square matrices **A** and **B** are the same size, symmetric and that **AB = BA**. Show that **AB** is a symmetric matrix.

$$(AB)^T = B^T A^T = BA = AB$$

$$\begin{matrix} \downarrow \\ A^T = A \\ B^T = B \end{matrix}$$

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⑤ 2. The following augmented matrix is in RREF. Find the solution of the system using the unknowns $x, y, z,$ and w . Write the solution as a column vector. ($\text{col}_1(A)$ are the coefficients of x , $\text{col}_2(A)$ are the coefficients of y , etc.)

$$A = \left[\begin{array}{cccc|c} 1 & -5 & 0 & 10 & 19 \\ 0 & 0 & 1 & 2 & 15 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right]$$

$$x - 5y + 10w = 19 \Rightarrow x = 5y - 10w + 19$$

$$z + 2w = 15 \Rightarrow z = -2w + 15$$

$$\text{Answer} \rightarrow \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} 5y - 10w + 19 \\ y \\ -2w + 15 \\ w \end{bmatrix}$$

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③ 3. Let $f(x) = Ax$ be a matrix transformation from \mathbb{R}^3 to \mathbb{R}^5 . What size is matrix **A**?

Answer 5x3

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⑧ 4. Find the RREF of matrix $\begin{bmatrix} 2 & 4 & 6 & 4 \\ 0 & 8 & 10 & 0 \\ 3 & 2 & 4 & 7 \end{bmatrix}$. Show your row operations and work! (Draw a box around your RREF matrix.)

$$\text{Answer} \quad \boxed{\begin{bmatrix} 1 & 0 & 1/2 & 0 \\ 0 & 1 & 5/4 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}}$$

Ⓔ 1. Given that square matrices **A** and **B** are the same size and symmetric. Show that **A + B** is a symmetric matrix.

$$(A+B)^T = A^T + B^T = A + B$$

$$\begin{aligned} \Downarrow \\ A^T &= A \\ B^T &= B \end{aligned}$$

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Ⓕ 2. The augmented matrix is in RREF. Find the solution of the system using the unknowns x, y, z, and w. Write the solution as a column vector. (col₁(A) are the coefficients of x, col₂(A) are the coefficients of y, etc.)

$$A = \left[\begin{array}{cccc|c} 1 & 6 & 0 & 3 & 19 \\ 0 & 0 & 1 & -2 & 15 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right]$$

$$\begin{aligned} x + 6y + 3w &= 19 \Rightarrow x = 19 - 6y - 3w \\ z - 2w &= 15 \Rightarrow z = 15 + 2w \end{aligned}$$

$$\text{Answer} \rightarrow \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} 19 - 6y - 3w \\ y \\ 15 + 2w \\ w \end{bmatrix}$$

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Ⓖ 2. Let $f(x) = Ax$ be a matrix transformation from \mathbb{R}^4 to \mathbb{R}^2 . What size is matrix **A**?

Answer 2x4

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Ⓗ 3. Find the RREF of matrix $\begin{bmatrix} 2 & 4 & 6 & 4 \\ 0 & 10 & 16 & 0 \\ -4 & 2 & 4 & 5 \end{bmatrix}$. Show your row operations and work! (Draw a box around your RREF matrix.)

$$\text{Answer} \quad \boxed{\begin{bmatrix} 1 & 0 & -1/5 & 0 \\ 0 & 1 & 8/5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}}$$