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1. Compute the following matrix operations, or explain why they are undefined.

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

$$B = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$$

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

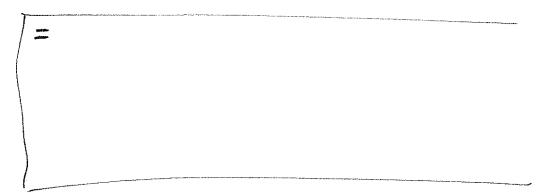
(a)
$$2A - B$$

$$= 2^{-1} \begin{bmatrix} 1 & 3 & 0 \\ 4 & 1 & 0 \\ -1 & 0 & 6 \end{bmatrix} + (-1)^{-1} \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$$

(b)
$$AB - 2I_3$$

$$= \left(\begin{bmatrix} 1 & 3 & 0 \\ 4 & 1 & 0 \\ -1 & 0 & 6 \end{bmatrix} \begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix} \right) + (-2) \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(c)
$$2A + 4C$$



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2. For each of the following, compute the product or explain why it is undefined.

(a)
$$\begin{bmatrix} 1 & 2 \\ 4 & 0 \\ 3 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & -1 \end{bmatrix}$$
3×3

(b)
$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & -1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \end{bmatrix}$$

(c)
$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 4 & 0 \\ 0 & 3 \end{bmatrix}$$

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- 3. Let $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 0 \\ -1 & 0 & 1 \end{bmatrix}$
 - (a) Compute the inverse of A, or explain why it does not exist.

reduce [AII3] until you find [I3[A-1]

(b) Use A^{-1} to solve the equation $A\vec{\mathbf{x}} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$.

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4. Let $B = \begin{bmatrix} \vec{\mathbf{b}}_1 & \vec{\mathbf{b}}_2 \end{bmatrix}$. Suppose that $\vec{\mathbf{b}}_2 = 3\vec{\mathbf{b}}_1$.

Prove that that the columns of AB are linearly dependent.

5. Use the properties of transpositions to rewrite $(A^T \cdot B^T)^T$. You must show all steps.

$$(A^{\mathsf{T}} \cdot B^{\mathsf{T}})^{\mathsf{T}} = (B^{\mathsf{T}})^{\mathsf{T}} \cdot (A^{\mathsf{T}})^{\mathsf{T}}$$

$$= B \cdot A$$

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6. Use the properties of inverses to rewrite $(A^{-1} \cdot B^{-1})^{-1}$. You must show all steps.