

4. If A and B are 2×2 matrices, $\det(A) = 4$ and $\det(B) = 3$, what is $\det((3A)B^{-1})$?
- A) 1 B) -1 C) 4 D) 12 E) -12 F) 54 G) -108 H) none of the above

$$\det(3A \cdot B^{-1}) = 3^2 \det A \cdot \frac{1}{\det B} = \frac{9 \cdot 4}{3} = 12$$

5. If H and K are subspaces of a finite dimensional vector space V , which of the following is *not* true?

- A) H is closed under addition B) K is closed under scalar multiplication.
 C) $0 \in H$ D) $\dim K \leq \dim V$ E) The intersection $H \cap K$ is also a subspace of V
 F) The union $H \cup K$ is also a subspace of V G) more than one of the above are untrue H) none of the above (all are true)

(see homework)

6. Let $\mathbf{x} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$ (in coordinates of the standard basis for \mathbb{R}^2) and let $\mathcal{B} = \left\{ \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \end{bmatrix} \right\}$ be an alternate basis. Find $[\mathbf{x}]_{\mathcal{B}}$.

- A) $\begin{bmatrix} -1 \\ 11 \end{bmatrix}$ B) $\begin{bmatrix} -1 \\ \frac{1}{2} \end{bmatrix}$ C) $\begin{bmatrix} -1 \\ 1 \end{bmatrix}$ D) $\begin{bmatrix} \frac{10}{3} \\ \frac{1}{3} \end{bmatrix}$
 E) none of the above

$$\begin{bmatrix} 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 1 & 2 \end{bmatrix} [\mathbf{x}]_{\mathcal{B}}$$

↙ inverse

$$[\mathbf{x}]_{\mathcal{B}} = \frac{1}{3} \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \end{bmatrix} = \begin{bmatrix} \frac{10}{3} \\ \frac{1}{3} \end{bmatrix}$$