

Math 122-002 201730
Practice Assignment # 4

1. Let A be an $m \times n$ matrix such that A^2 can be formed. What can you say about m and n ?
2. Find A in terms of B if $A - B = 5A + 3B$.
3. Suppose that X, Y, A, B are matrices of the same size. If $4X + 3Y = A$ and $2X + 2Y = B$, write X and Y in terms of A and B .
4. Suppose that $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ for some numbers a, b, c, d . Show that
 - (a) if A commutes with $B = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$, then $b = c = 0$;
 - (b) if A commutes with $B = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$, then $c = 0, a = d$.

5. Let

$$\vec{a}_1 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}, \quad \vec{a}_2 = \begin{bmatrix} 3 \\ 0 \\ 2 \end{bmatrix}, \quad \vec{a}_3 = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}, \quad \vec{a}_4 = \begin{bmatrix} 0 \\ -3 \\ 5 \end{bmatrix}.$$

In each case express \vec{b} as a linear combination of $\vec{a}_1, \vec{a}_2, \vec{a}_3, \vec{a}_4$, or show that such a linear combination doesn't exist.

(a) $\vec{b} = \begin{bmatrix} 0 \\ 3 \\ 5 \end{bmatrix}$

(b) $\vec{b} = \begin{bmatrix} 4 \\ 1 \\ 1 \end{bmatrix}$