Linear Algebra

Assignment 9 MATH 2318 (Fall 2022)

Deadline: Friday November 11th, 11:59pm.

Policy to turn in assignment:

- Assignment should be submitted via BlackBoard.
- Student needs to turn in their assignment as a single PDF file.
- No email or late submission will be accepted.

$\boxed{\text{5 points}}$ 1. Let $A = \begin{bmatrix} 1 & 2 & 1 & 3 & 0 \\ 1 & 2 & 2 & 4 & 1 \\ 2 & 4 & 1 & 3 & -1 \end{bmatrix}$. Find a basis for $\text{Null}(A)$ and $\text{Col}(A)$. What is $\text{rank}(A)$?

$\boxed{\text{4 points}}$ 2. Find a basis for $H = \left\{ \begin{bmatrix} 3a + 6b - c \\ 6a - 2b - 2c \\ -9a + 5b + 3c \\ -3a + b + c \end{bmatrix} : a, b, c \in \mathbb{R} \right\}$. *Hint*: Write H as a Span.

$\boxed{\text{4 points}}$ 3. Show that the set $B = \{2 + 2x + x^2, 2 + 2x + 2x^2, x + 2x^2\}$ is a basis for $\mathbb{P}_2$. *Hint*: Recall that $\dim(\mathbb{P}_2) = 3$ and note that B has three vectors.

$\boxed{\text{3 points}}$ 4. For each of the following, determine if the statement is true or false. Provide a short reasoning (one or two sentences).

a) The column space of a matrix A is the set of solutions of $A\vec{x} = \vec{b}$.

b) If a vector $\vec{v}$ is in $\text{Col}(A)$, then $A\vec{x} = \vec{v}$ has a unique solution.

c) Let A_1, A_2, A_3, A_4 be 2×2 matrices such that $M_{2\times 2} = \text{Span}\{A_1, A_2, A_3, A_4\}$. The set $\{A_1, A_2, A_3, A_4\}$ is a basis for $M_{2\times 2}$.