

Introductory Linear Algebra-Bases for Linear subspaces Home Assignment

MATH 250

(Instructor: Tom Benhamou)

Nov 6, 2024

For the following H and V :

- Show that H is a subspace of V .
- Find a basis for H . Explain your answer.

$$(1) V = \mathbb{R}^3 \text{ and } H = \left\{ \begin{bmatrix} a \\ b \\ c \end{bmatrix} \in \mathbb{R}^3 \mid 2a - b - c = 0 \right\}.$$

- (2) $V = M_{3 \times 3}(\mathbb{R})$, and H is the subspace of all upper triangular matrices
i.e. matrices of the form:

$$\begin{bmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{bmatrix}$$

- (3) $V = \mathbb{R}^4$ and

$$H = \text{Sp} \left(\begin{bmatrix} 1 \\ 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 3 \\ 1 \\ -1 \end{bmatrix} \right)$$

- (4) $V = \mathbb{P}_3(\mathbb{R})$ and H consists of all polynomials of p of degree at most 3
such that $p(0) + p'(1) = 0$ (here p' is the derivative of p).