

**21001, Section 01, Linear Algebra and applications**  
**HW 6, DUE Monday, October 24**  
**Instructor: Prof. Artem Zvavitch**  
**GOOD LUCK!!!**

**Problem 1.** Consider the set  $W$  consisting of all  $2 \times 3$  matrices of the form

$$A = \begin{bmatrix} a & -b & 0 \\ 0 & c & b \end{bmatrix},$$

where  $a, b, c$  are arbitrary real numbers. Show that  $W$  is a subspace of  $M_{2,3}$  (all  $2 \times 3$  matrices).

**Problem 2.** Is  $W = \{(x, x+1, x+2) : x \text{ is a real number}\}$  a subspace of  $\mathbb{R}^3$  ?

**Problem 3.** Let  $A$  be a  $2 \times 2$  matrix prove that  $W = \{x \in \mathbb{R}^2 : Ax = \mathbf{0}\}$  is a subspace of  $\mathbb{R}^2$ .

**Problem 4.** Let  $A$  be a  $2 \times 2$  matrix show that if  $\mathbf{b} \neq \mathbf{0}$  ( $\mathbf{b}$  is not zero vector) then  $W = \{x \in \mathbb{R}^2 : Ax = \mathbf{b}\}$  is NOT a subspace of  $\mathbb{R}^2$ .

**Problem 5.** Show that set  $S = \{(0, 1, 2), (1, 1, 0), (1, 2, 2)\}$  DOES NOT span  $\mathbb{R}^3$ .