

MATHEMATICS 2270. Homework # 4.

1. Which of the following are subspaces of \mathbb{R}^3 ? Justify your answers.

(a) $V = \{(x, y, z) : xyz = 0\}$.

(b) $W = \{(x, y, z) : x + y + z = 0\}$.

(c) $U = \{(x, y, z) : x, y, z \text{ are integers}\}$.

(Recall that integers are the numbers: $0, \pm 1, \pm 2, \pm 3, \dots$)

2. Decide if the given vectors in \mathbb{R}^3 are linearly independent:

$$(1, 2, 2), (1, 1, 1).$$

3. Decide if the following vectors span \mathbb{R}^3 (use Summary 3.3.11):

$$(1, 1, 1), (2, 3, 1), (3, 4, 2).$$

Justify your answer.

4. Find a basis of the kernel and the nullity of the following matrix:

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 2 \\ 1 & 1 & 2 \end{bmatrix}.$$

Justify your answer.

5. Find a basis of the image and the dimension of the image of the following matrix:

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 1 & 3 & 0 \\ 2 & 5 & 1 \\ 0 & 1 & -1 \end{bmatrix}.$$

6. §3.4, # 10.