

Term Test Ba version 1

(1) [5 points] Consider the vector space of 2x2 matrices. Are the following four matrices a basis for this vector space?

$$A = \begin{bmatrix} -9 & -4 \\ -3 & 2 \end{bmatrix}, B = \begin{bmatrix} -5 & 2 \\ -6 & -5 \end{bmatrix}, C = \begin{bmatrix} 1 & -8 \\ 9 & 12 \end{bmatrix}, D = \begin{bmatrix} 4 & -8 \\ -2 & 7 \end{bmatrix}$$

- If yes, find the coordinates in terms of this basis for

$$D = \begin{bmatrix} -9 & 2 \\ 1 & 7 \end{bmatrix}$$

- If no, express one of the four given matrices by the other three.

(2) [5 points] Solve the following system of linear equations.

$$\begin{array}{rrcrcl} 2a & - & 6b & - & 3c & = & 13 \\ -5a & - & 3b & + & c & = & 15 \\ 19a & - & 3b & - & 9c & = & -19 \end{array}$$

If the system is consistent and dependent, provide your answer in the form

$$S = \{u \in \mathbb{R}^3 \mid u \text{ corresponds to } \vec{u} = \vec{v}_0 + s_1\vec{v}_1 + \dots + s_n\vec{v}_n\}$$

where n is the dimension of the solution space and $s_i \in \mathbb{R}$ for $i = 1, \dots, n$. Note that $(-1, -3, 1)^\top$ solves the system.

(3) [5 points] Consider the following three vectors in \mathbb{R}^3 ,

$$\begin{pmatrix} -7 \\ -2 \\ 3 \end{pmatrix}, \begin{pmatrix} -6 \\ -10 \\ -2 \end{pmatrix}, \begin{pmatrix} 10 \\ -3 \\ 7 \end{pmatrix}$$

Determine the three lengths of these vectors and the three angles between them. If they replace the origin to the points P, Q, R , determine the plane equation for the plane containing the three points, using the cross product.