

Term Test Ba version 2

(1) [5 points] Solve the following system of linear equations.

$$\begin{array}{rrcrcl} 4x & - & y & + & 2z & = & -8 \\ -2x & + & 3y & + & 7z & = & 17 \\ 8x & + & 3y & + & 20z & = & 10 \end{array}$$

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 $(-2, 2, 1)^\top$ solves the system.

(2) [5 points] Consider the vector space of 2x2 matrices. Are the following three 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.

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

$$\begin{pmatrix} -8 \\ -10 \\ 2 \end{pmatrix}, \begin{pmatrix} 0 \\ -1 \\ -3 \end{pmatrix}, \begin{pmatrix} -2 \\ 6 \\ 5 \end{pmatrix}$$

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.