

### Term Test Ba version 1

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

$$A = \begin{bmatrix} -9 & -4 \\ -3 & 2 \end{bmatrix}, B = \begin{bmatrix} -5 & 2 \\ -6 & -5 \end{bmatrix}, C = \begin{bmatrix} 0 & -14 \\ 1 & 14 \end{bmatrix}, D = \begin{bmatrix} 4 & -8 \\ -2 & 7 \end{bmatrix}$$

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

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

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

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

$$\begin{array}{rcl} 2x & - & 5y = 6 \\ -x & + & \frac{5}{2}y = -3 \end{array}$$

Provide the solution set in the following form, specifying  $A, B, C, D$ . If your solution is unique, then  $C = 0$  and  $D = 0$ .

$$\left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} A \\ B \end{pmatrix} + s \begin{pmatrix} C \\ D \end{pmatrix}, s \in \mathbb{R} \right\}$$

(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 in degrees (not radians). 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.