

### Term Test Ba version 2

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

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

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 parabolas with the equation  $y = a(x - h)^2 + k$ . Are the following three parabolas a basis for this vector space?

$$\begin{array}{rcl} y & = & -6(x - 5)^2 - 8 \\ y & = & (x - 2)^2 - 4 \\ y & = & -15(x - 4)^2 - 4 \end{array}$$

- If yes, find the coordinates in terms of this basis for  $y = -3(x - 20)^2 - 66$ .
- If no, express one of the three given parabolas by the other two.

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

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

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.