

Var. 1 (131012)*Adeel*

- Is the set of vectors $e_1 = (1, 3, 1, -1)^T$, $e_2 = (3, 5, 2, -4)^T$, $e_3 = (-5, -2, -2, 5)^T$ linear independent and/or a generating set in \mathbb{R}^4 ?
- Find the coordinate column of $x = (-4, 3, 0)^T$ in the basis $f_1 = (0, 1, -1)^T$, $f_2 = (1, -2, 1)^T$, $f_3 = (1, 1, -1)^T$.
- Find a basis of the linear span of columns $(-1, 4, 4)^T$, $(-1, 4, 4)^T$, $(1, -1, -3)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 2 & -3 & -1 & 1 \\ 6 & -8 & 2 & 2 \\ -3 & 4 & -1 & -1 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, -1, -3)^T$, $e_2 = (1, -1, -2)^T$, $e_3 = (0, 1, -1)^T$ and $f_1 = (1, 1, -2)^T$, $f_2 = (1, 2, -2)^T$, $f_3 = (2, -1, -3)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 2 (131012)*Ali Ovais*

- Is the set of vectors $e_1 = (5, 5, -2)^T$, $e_2 = (1, 2, 1)^T$, $e_3 = (-2, -2, 1)^T$, $e_4 = (5, 6, -3)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (-1, 0, 3)^T$ in the basis $f_1 = (1, 1, -2)^T$, $f_2 = (1, 1, -1)^T$, $f_3 = (0, 1, 1)^T$.
- Find a basis of the linear span of columns $(8, -5, -3)^T$, $(-2, 2, 1)^T$, $(4, -1, -1)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 2 & 1 & 2 & 1 \\ 4 & 1 & 3 & 4 \\ 1 & 3 & 3 & -8 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, 0, 3)^T$, $e_2 = (2, 1, 4)^T$, $e_3 = (2, 1, 5)^T$ and $f_1 = (0, 1, 1)^T$, $f_2 = (1, -2, -2)^T$, $f_3 = (3, -3, -2)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 3 (131012)*Faraha*

- Is the set of vectors $e_1 = (2, 1, -3, -3)^T$, $e_2 = (6, 2, -4, -5)^T$, $e_3 = (7, 2, -5, -5)^T$ linear independent and/or a generating set in \mathbb{R}^4 ?
- Find the coordinate column of $x = (-1, 4, 6)^T$ in the basis $f_1 = (1, -3, -2)^T$, $f_2 = (0, 1, 1)^T$, $f_3 = (-1, 4, 4)^T$.
- Find a basis of the linear span of columns $(4, 3, 2)^T$, $(3, 1, 1)^T$, $(-1, 3, 1)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 6 & -2 & -1 & 2 \\ -3 & -1 & 1 & -3 \\ 1 & 2 & -1 & 4 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, -1, 1)^T$, $e_2 = (2, -1, 1)^T$, $e_3 = (2, -4, 5)^T$ and $f_1 = (1, 2, -3)^T$, $f_2 = (2, 4, -5)^T$, $f_3 = (1, 3, -4)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 4 (131012)*Kamran*

- Is the set of vectors $e_1 = (-1, 2, 1, 1)^T$, $e_2 = (-6, 3, -6, 3)^T$, $e_3 = (-1, 5, 5, 2)^T$ linear independent and/or a generating set in \mathbb{R}^4 ?
- Find the coordinate column of $x = (-2, -1, -1)^T$ in the basis $f_1 = (0, 1, 1)^T$, $f_2 = (1, -2, -1)^T$, $f_3 = (-2, 2, 1)^T$.
- Find a basis of the linear span of columns $(3, 5, -8)^T$, $(1, 3, -4)^T$, $(1, 2, -3)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} -3 & -1 & 1 & 1 \\ 4 & -1 & -5 & -1 \\ -5 & -5 & -1 & 2 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, 3, -1)^T$, $e_2 = (-1, -3, 2)^T$, $e_3 = (-1, -2, 0)^T$ and $f_1 = (1, 1, 1)^T$, $f_2 = (-1, -1, 0)^T$, $f_3 = (2, 3, -1)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 5 (131012)*Ahsan Khan*

- Is the set of vectors $e_1 = (3, 1, 2)^T$, $e_2 = (-3, -2, 6)^T$, $e_3 = (6, 3, -1)^T$, $e_4 = (-8, -3, -3)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (-2, -3, -5)^T$ in the basis $f_1 = (1, 1, 3)^T$, $f_2 = (1, 1, 4)^T$, $f_3 = (0, 1, 1)^T$.
- Find a basis of the linear span of columns $(-2, -8, 3)^T$, $(-3, -7, 7)^T$, $(1, 3, -2)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 5 & -7 & 2 & 5 \\ 2 & -3 & 1 & 2 \\ 6 & -8 & 2 & 5 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, -1, 0)^T$, $e_2 = (-1, 2, 3)^T$, $e_3 = (-1, 1, 1)^T$ and $f_1 = (1, -3, -1)^T$, $f_2 = (1, -3, 0)^T$, $f_3 = (-1, 4, 3)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 6 (131012)*Yameen*

- Is the set of vectors $e_1 = (1, -4, 2)^T$, $e_2 = (-2, 2, 3)^T$, $e_3 = (1, -2, -1)^T$, $e_4 = (1, -1, -2)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (-7, -3, -8)^T$ in the basis $f_1 = (1, 1, -1)^T$, $f_2 = (1, 1, 0)^T$, $f_3 = (-2, -1, -1)^T$.
- Find a basis of the linear span of columns $(-2, 8, 5)^T$, $(-2, 8, 5)^T$, $(1, -3, -2)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 1 & 2 & 2 & 3 \\ 1 & 3 & 1 & 2 \\ 3 & 9 & 7 & 7 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, 1, -3)^T$, $e_2 = (-1, -1, 4)^T$, $e_3 = (0, 1, -1)^T$ and $f_1 = (1, 3, -2)^T$, $f_2 = (0, 1, 1)^T$, $f_3 = (1, 2, -2)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 7 (131012)*Nehad*

- Is the set of vectors $e_1 = (1, 4, -3, -7)^T$, $e_2 = (2, 1, 1, 3)^T$, $e_3 = (1, 1, -1, -2)^T$ linear independent and/or a generating set in \mathbb{R}^4 ?
- Find the coordinate column of $x = (-1, -5, 1)^T$ in the basis $f_1 = (1, 1, -1)^T$, $f_2 = (1, 2, -1)^T$, $f_3 = (1, -1, 0)^T$.
- Find a basis of the linear span of columns $(1, -2, 3)^T$, $(1, -4, 2)^T$, $(2, -2, 7)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 4 & 8 & 3 & -8 \\ 2 & -3 & -1 & 2 \\ 2 & 2 & 1 & -3 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, 2, 3)^T$, $e_2 = (1, 2, 4)^T$, $e_3 = (0, 1, 3)^T$ and $f_1 = (1, 1, -1)^T$, $f_2 = (1, 1, 0)^T$, $f_3 = (2, 3, 2)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 8 (131012)*Shamas*

- Is the set of vectors $e_1 = (-7, -3, -2, -3)^T$, $e_2 = (2, 2, 1, 1)^T$, $e_3 = (-3, -7, -3, -2)^T$ linear independent and/or a generating set in \mathbb{R}^4 ?
- Find the coordinate column of $x = (-3, -1, -7)^T$ in the basis $f_1 = (1, -1, 1)^T$, $f_2 = (2, -1, 2)^T$, $f_3 = (0, 1, 1)^T$.
- Find a basis of the linear span of columns $(1, -2, -2)^T$, $(-1, -1, 5)^T$, $(-3, 5, 7)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 1 & -3 & -1 & -2 \\ 1 & -1 & -2 & -1 \\ 2 & 1 & -7 & -1 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, 2, -1)^T$, $e_2 = (1, 2, 0)^T$, $e_3 = (-3, -5, -1)^T$ and $f_1 = (1, 1, -1)^T$, $f_2 = (0, 1, 1)^T$, $f_3 = (3, 4, -1)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 9 (131012)*Umar*

- Is the set of vectors $e_1 = (-2, -2, 5)^T$, $e_2 = (3, 8, -5)^T$, $e_3 = (1, 3, -1)^T$, $e_4 = (1, 2, -2)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (-5, 7, 7)^T$ in the basis $f_1 = (1, -1, -1)^T$, $f_2 = (1, 0, 1)^T$, $f_3 = (2, -2, -1)^T$.
- Find a basis of the linear span of columns $(6, 2, 1)^T$, $(3, 1, 1)^T$, $(-6, -2, -3)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 1 & 1 & -1 & -1 \\ 1 & 2 & -1 & -3 \\ 2 & 2 & -1 & -6 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, 2, 1)^T$, $e_2 = (-3, -5, -4)^T$, $e_3 = (-2, -3, -2)^T$ and $f_1 = (1, -1, 2)^T$, $f_2 = (2, -2, 5)^T$, $f_3 = (1, 0, 1)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 10 (131012)*Yasir*

- Is the set of vectors $e_1 = (7, 1, 4)^T$, $e_2 = (1, 1, 2)^T$, $e_3 = (2, -1, -1)^T$, $e_4 = (2, -1, -1)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (7, 5, 8)^T$ in the basis $f_1 = (1, 1, 1)^T$, $f_2 = (-2, -2, -1)^T$, $f_3 = (1, 2, -1)^T$.
- Find a basis of the linear span of columns $(-7, 2, -3)^T$, $(-5, -2, 7)^T$, $(-2, 1, -2)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} -2 & -3 & 1 & -4 \\ -2 & 3 & 5 & -1 \\ 1 & -1 & -2 & 1 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (0, 1, -1)^T$, $e_2 = (1, -1, -3)^T$, $e_3 = (2, -3, -4)^T$ and $f_1 = (1, -2, -2)^T$, $f_2 = (-2, 5, 6)^T$, $f_3 = (-2, 5, 7)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 11 (131012)*Zunaira*

- Is the set of vectors $e_1 = (-5, 2, 1)^T$, $e_2 = (-2, -1, 1)^T$, $e_3 = (-7, -2, 3)^T$, $e_4 = (-3, -3, 2)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (0, 4, -3)^T$ in the basis $f_1 = (1, 2, 0)^T$, $f_2 = (-1, -1, -1)^T$, $f_3 = (-1, 1, -2)^T$.
- Find a basis of the linear span of columns $(-1, 2, 2)^T$, $(-3, 4, 4)^T$, $(1, -1, -1)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} -1 & 7 & -3 & -2 \\ -2 & -1 & -1 & 6 \\ 1 & -1 & 1 & -2 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (0, 1, -1)^T$, $e_2 = (1, -2, 1)^T$, $e_3 = (3, -5, 3)^T$ and $f_1 = (1, -2, 3)^T$, $f_2 = (-2, 4, -5)^T$, $f_3 = (1, -1, 0)^T$ find the basis-change matrix $C_{e \rightarrow f}$.

Var. 12 (131012)

- Is the set of vectors $e_1 = (-5, 4, -1)^T$, $e_2 = (2, -3, 1)^T$, $e_3 = (2, -5, 2)^T$, $e_4 = (1, -8, 3)^T$ linear independent and/or a generating set in \mathbb{R}^3 ?
- Find the coordinate column of $x = (1, 0, -2)^T$ in the basis $f_1 = (1, 1, -1)^T$, $f_2 = (2, 3, -1)^T$, $f_3 = (-2, -4, 1)^T$.
- Find a basis of the linear span of columns $(2, 3, -7)^T$, $(1, -6, -1)^T$, $(1, -3, -2)^T$.
- Find a basis of the space of solutions of the linear system $\begin{pmatrix} 6 & -3 & 3 & 9 \\ -4 & 1 & 5 & -1 \\ -3 & 1 & 2 & -2 \end{pmatrix} x = 0$.
- Given 2 bases of \mathbb{R}^3 $e_1 = (1, -3, 2)^T$, $e_2 = (-1, 4, -1)^T$, $e_3 = (-2, 6, -3)^T$ and $f_1 = (1, -1, 3)^T$, $f_2 = (-2, 2, -5)^T$, $f_3 = (1, 0, 4)^T$ find the basis-change matrix $C_{e \rightarrow f}$.