(81) [1, Section 4.3] Let \( A \) be an \( n \times n \) matrix. Is \( H = \{ x \in \mathbb{R}^n \mid Ax = 2x \} \) a subspace of \( \mathbb{R}^n \)? Which conditions for a subspace are fulfilled by \( H \)?

(82) [1, Section 4.3] Let \( u, v \) be linearly independent vectors in a vector space \( V \).
(a) Find all \( x_1, x_2 \in \mathbb{R} \) such that \( x_1(u + v) + x_2(u - v) = 0 \).
(b) Are the vectors \( u + v \) and \( u - v \) linearly independent?

(83) [1, Section 4.4] Let \( B = (b_1, b_2, b_3) = (1 + t, 1 + t^2, t + t^2) \) be a basis of \( \mathbb{P}_2 \), and let \( u = 1 + t^2 \) and \( v = 2t \).
(a) Write both \( u \) and \( v \) as linear combination of \( b_1, b_2, b_3 \).
(b) Give the \( B \)-coordinates \([u]_B \) and \([v]_B \).

(84) For which \( \lambda \in \mathbb{R} \) is \( \lambda(\lambda^2 - 2)(\lambda^2 + 1)(\lambda^2 - 3\lambda + 2) = 0 \)?

(85) [1, Section 3.2] For which \( \mu \in \mathbb{R} \) has the matrix
\[
B = \begin{bmatrix}
6 - \mu & 2 \\
-6 & -1 - \mu \\
\end{bmatrix}
\]
a determinant \( \det B = 0 \)?

(86) [1, Section 4.2] Let
\[
A = \begin{bmatrix}
6 & 2 \\
-6 & -1 \\
\end{bmatrix}.
\]
(a) Compute the matrices \( A - 2I \) and \( A - I \).
(b) Find all \( x \in \mathbb{R}^2 \) such that \( Ax = 2x \). Give the parametric vector form for the solution set.
Hint: \( Ax = 2x \) iff \( Ax = 2Ix \) iff \( (A - 2I)x = 0 \).
(c) Find all \( x \in \mathbb{R}^2 \) such that \( Ax = 3x \). Give the parametric vector form.
(d) Find all \( x \in \mathbb{R}^2 \) such that \( Ax = x \). Give the parametric vector form.

(87) [1, Section 3.2] For which \( \lambda \in \mathbb{R} \) has the matrix
\[
B = \begin{bmatrix}
-2 - \lambda & 0 & 2 \\
6 & 2 - \lambda & -3 \\
-6 & 0 & 5 - \lambda \\
\end{bmatrix}
\]
a determinant \( \det B = 0 \)?

(88) [1, Section 4.2] Let
\[
A = \begin{bmatrix}
-2 & 0 & 2 \\
6 & 2 & -3 \\
-6 & 0 & 5 \\
\end{bmatrix}
\]
(a) Compute the matrices \( A - 2I \) and \( A - I \).
(b) Find all $x \in \mathbb{R}^3$ such that $Ax = 2x$. Give the parametric vector form for the solution set.

(c) Find all $x \in \mathbb{R}^3$ such that $Ax = x$. Give the parametric vector form.

REFERENCES