Contents

1 Section 4.3

1.1 4.3.11

Express the indicated vector $\vec{w}$ as a linear combination of the given vectors $\vec{v}_1$ and $\vec{v}_2$ if this is possible. If not, show that it is impossible.

$$\vec{w} = \begin{bmatrix} -8 \\ 0 \\ 0 \\ 6 \end{bmatrix}, \vec{v}_1 = \begin{bmatrix} 7 \\ 9 \\ -6 \\ 3 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} 2 \\ 6 \\ -4 \\ 4 \end{bmatrix}$$

$$(\mathbf{A}|\vec{v}) = \left[\begin{array}{cc|c} 7 & 2 & -8 \\ 9 & 6 & 0 \\ -6 & -4 & 0 \\ 3 & 4 & 6 \end{array}\right]$$

$$\begin{aligned} \mathbf{A}_2 &= 7\mathbf{A}_2 - 9\mathbf{A}_1 \\ \mathbf{A}_2 &= \frac{1}{24}\mathbf{A}_2 \\ \mathbf{A}_3 &= 7\mathbf{A}_3 + 6\mathbf{A}_1 \\ \mathbf{A}_3 &= -\frac{1}{16}\mathbf{A}_3 \\ \mathbf{A}_4 &= 7\mathbf{A}_4 - 3\mathbf{A}_1 \\ \mathbf{A}_4 &= \frac{1}{22}\mathbf{A}_4 \end{aligned}$$

$$(\mathbf{A}|\vec{v}) = \left[\begin{array}{cc|c} 7 & 2 & -8 \\ 0 & 1 & 3 \\ 0 & 1 & 3 \\ 0 & 1 & 3 \end{array}\right]$$

$$\begin{aligned} \mathbf{A}_3 &= \mathbf{A}_3 - \mathbf{A}_2 \\ \mathbf{A}_4 &= \mathbf{A}_4 - \mathbf{A}_2 \end{aligned}$$

$$(\mathbf{A}|\vec{v}) = \left[\begin{array}{cc|c} 7 & 2 & -8 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{array}\right]$$

$$\begin{cases} 7x_1 + 2x_2 = -8 \\ x_2 = 3 \end{cases}$$

$$7x_1 + 2(3) = -8$$

$$x_1 = -2$$

Therefore $\vec{w}$ can be expressed as:

$$\boxed{\vec{w} = (-2)\vec{v}_1 + (3)\vec{v}_2}$$