

1.48(a)

1 1.48(a), §1 Asked

Given: The vectors

$$\vec{v} = (2, 5) \quad \vec{u}_1 = (1, 2) \quad \vec{u}_2 = (3, 5)$$

Asked: Write \vec{v} as a linear combination $a\vec{u}_1 + b\vec{u}_2$, i.e., find a and b so that $\vec{v} = a\vec{u}_1 + b\vec{u}_2$

2 1.48(a), §2 Solution

$$\vec{v} = (2, 5) \quad \vec{u}_1 = (1, 2) \quad \vec{u}_2 = (3, 5)$$

Write \vec{v} as a linear combination $a\vec{u}_1 + b\vec{u}_2$, i.e., find a and b so that $\vec{v} = a\vec{u}_1 + b\vec{u}_2$

$$\begin{pmatrix} 2 \\ 5 \end{pmatrix} = a \begin{pmatrix} 1 \\ 2 \end{pmatrix} + b \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} 1a + 3b \\ 2a + 5b \end{pmatrix}$$

$$\begin{aligned} a + 3b &= 2 & (1) \\ 2a + 5b &= 5 & (2) \end{aligned}$$

Eliminate a from equation (2) by subtracting 2 times (1):

$$\begin{aligned} a + 3b &= 2 & (1) \\ 0 - b &= 1 & (2') = (2) - 2(1) \end{aligned}$$

Solve from the bottom up, (2') giving that $b = -1$ and then (1) giving that $a = 5$.