

Homework - June 11  
Section 1.3

$$2. \mathbf{u} + \mathbf{v} = \begin{bmatrix} 3 \\ 2 \end{bmatrix} + \begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 3+2 \\ 2-1 \end{bmatrix} = \begin{bmatrix} 5 \\ 1 \end{bmatrix}.$$

$$\mathbf{u} - 2\mathbf{v} = \begin{bmatrix} 3 \\ 2 \end{bmatrix} - 2 \begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix} + \begin{bmatrix} -4 \\ 2 \end{bmatrix} = \begin{bmatrix} 3-4 \\ 2+2 \end{bmatrix} = \begin{bmatrix} -1 \\ 4 \end{bmatrix}.$$

12. To determine if  $\mathbf{b}$  is a linear combination of  $\mathbf{a}_1$ ,  $\mathbf{a}_2$ , and  $\mathbf{a}_3$ , we solve the augmented matrix.

$$\begin{bmatrix} 1 & 0 & 2 & -5 \\ -2 & 5 & 0 & 11 \\ 2 & 5 & 8 & -7 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 2 & -5 \\ 0 & 5 & 4 & 1 \\ 0 & 10 & 8 & 4 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 2 & -5 \\ 0 & 5 & 4 & 1 \\ 0 & 0 & 0 & 2 \end{bmatrix}.$$

This matrix is inconsistent, so  $\mathbf{b}$  is not a linear combination of the other vectors.

26. a)  $\mathbf{b}$  is in  $W$  if the augmented matrix  $\begin{bmatrix} 2 & 0 & 6 & 10 \\ -1 & 8 & 5 & 3 \\ 1 & -2 & 1 & 3 \end{bmatrix}$  is consistent.

$$\begin{bmatrix} 2 & 0 & 6 & 10 \\ -1 & 8 & 5 & 3 \\ 1 & -2 & 1 & 3 \end{bmatrix} \sim \begin{bmatrix} 1 & -2 & 1 & 3 \\ 0 & 6 & 6 & 6 \\ 0 & 4 & 4 & 4 \end{bmatrix} \sim \begin{bmatrix} 1 & -2 & 1 & 3 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$

This matrix is consistent.

b) The third column  $\begin{bmatrix} 6 \\ 5 \\ 1 \end{bmatrix}$  is in  $W$ , because it is a linear combination of the

columns of  $A$ . That is, we can write  $\begin{bmatrix} 6 \\ 5 \\ 1 \end{bmatrix} = 0 \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix} + 0 \begin{bmatrix} 0 \\ 8 \\ -2 \end{bmatrix} + 1 \begin{bmatrix} 6 \\ 5 \\ 1 \end{bmatrix}.$