

## SECTION 2.1

NUMBER 23

2.1.23

Are these vectors in  $\mathbb{R}^3$  dependent or independent:  $\{[1, -4, 3], [3, -11, 2], [1, -3, -4]\}$ ?

Solution

Let's use Theorem 2.1.A and let

$$W = \text{sp}([1, -4, 3], [3, -11, 2], [1, -3, -4]).$$

Consider matrix  $A$  with the three given vectors as columns:

$$A = \begin{bmatrix} 1 & 3 & 1 \\ -4 & -11 & -3 \\ 3 & 2 & -4 \end{bmatrix} \xrightarrow[\text{RREF}]{W_A} \begin{bmatrix} 1 & 0 & -2 \\ 0 & 2 & 1 \\ 0 & 0 & 0 \end{bmatrix} = H.$$

So, since the first and second columns of  $H$  contain pivots, then a basis for  $W$  is given by  $\{[1, -4, 3], [3, -11, 2]\}$ .

So  $\{[1, -4, 3], [3, -11, 2], [1, -3, -4]\}$  is NOT a basis for  $W$ . So it must be that the three given vectors are linearly dependent.  $\square$