# 3.3 Arithmetic on Vectors in 3-Dimensional Space

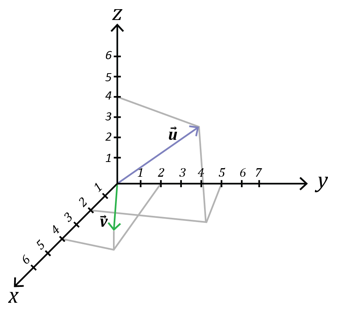
## ADDITION & SUBTRACTION OF VECTORS

To add or subtract two vectors, add or subtract their corresponding components.

To **add** the vectors and add their corresponding components.

Example (1)

So,

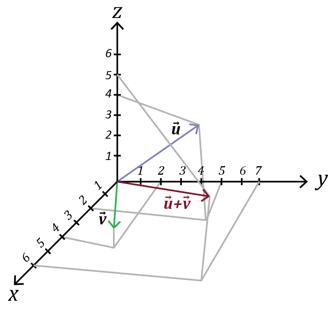


Now, graph this sum. Start at the origin.

Since the component is 6, move 6 units in the direction.

Since the component is, move 7 units in the direction.

Since the component is, move 5 units upward.



To **subtract** the vectors and subtract their corresponding components.

Example (2)

So,

## SCALAR MULTIPLICATION

Scalar multiplication is the multiplication of a vector by a real number (a scalar).

Suppose we let the letter represent a real number and be the vector Then, the scalar multiple of the vector is

Suppose and .

Example (1)

Then 3

Suppose and .

Example (2)

Then

Suppose , , and . Find

Example (3)

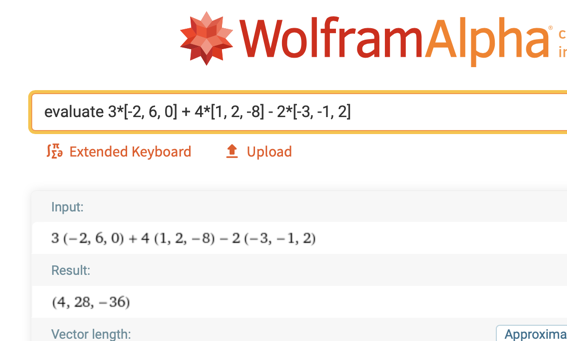
Then

## USING TECHNOLOGY

We can use technology to determine the value of adding or subtracting vectors.

Go to www.wolframalpha.com.

Suppose and , , and . Use WolframAlpha to find In the entry field enter evaluate 3\*[-2,6,0] + 4\*[1,2,-8] – 2\*[-3,-1,2].



WolframAlpha answers which is WolframAlpha’s notation for .

## EXAMPLES

1. Add the vectors

ANS:

1. Subtract the vector from the vector

ANS:

1. Given the three vectors, , , and ,  
   find .

ANS:

1. Suppose and , , and , find .

ANS:

## NOTE TO INSTRUCTOR

Consider working through these examples.

1. Add the vectors

ANS:

1. Subtract the vector from the vector .

ANS:

1. Given the three vectors, , , and ,  
   a. Find .  
   b. Find the length of the vector .

ANS: a. =   
 b.

1. Suppose and , , and , find

ANS:

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