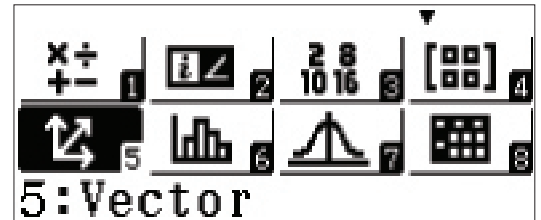


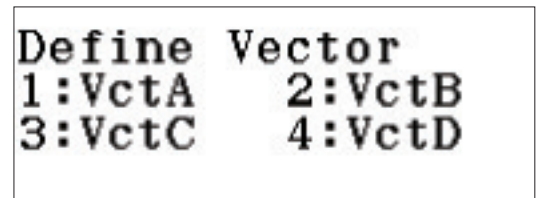
VECTOR

The fx-991EX is capable of handling vector calculations with vectors in 2 or 3 dimensions.

From the Main Menu, use the arrow keys to highlight the Vector icon and press \square or press $\boxed{5}$.

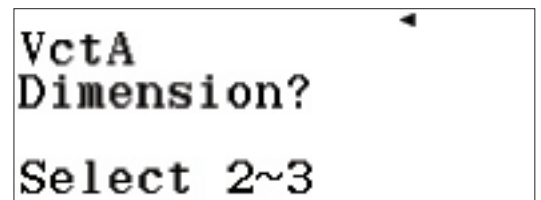


Let vectors \mathbf{u} and \mathbf{v} be defined in the 3-dimensional plane by the following: $\mathbf{u} = 2\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$ and $\mathbf{v} = 3\mathbf{i} - 4\mathbf{j} + 5\mathbf{k}$

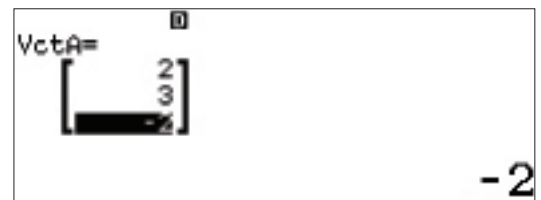


Define \mathbf{u} as Vector A with dimension 3.

Press $\boxed{1}$ (VctA) $\boxed{3}$ (Dimension).

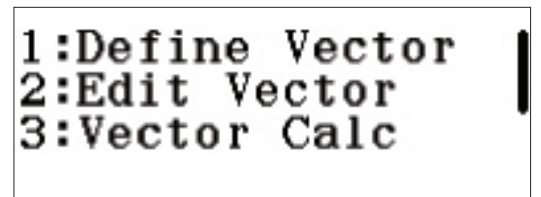


Enter the components of the vector and press \square after each one to move to the next value.

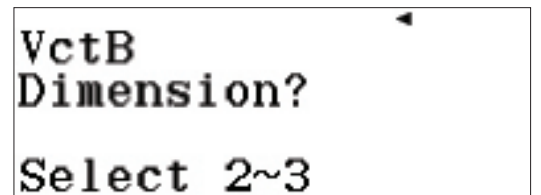


Define \mathbf{v} as Vector B with dimension 3.

Press $\boxed{\text{OPTN}}$ $\boxed{1}$ (Define Vector).



Press $\boxed{2}$ (VctB) $\boxed{3}$ (Dimension).



VECTOR

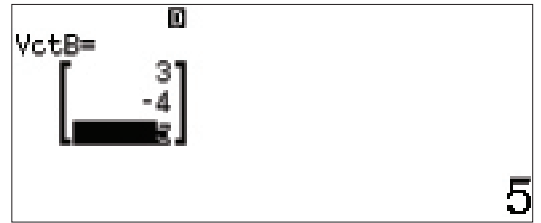
Enter the components of the vector and press $\boxed{\text{=}}$ after each one to move to the next value.

To execute basic vector operations, press $\boxed{\text{AC}}$ to enter Vector calculation.

Recall the names of the vectors and execute the desired operation by pressing $\boxed{\text{OPTN}}$.


Vector addition, subtractions, and multiplication are all available.

For subtraction, press $\boxed{3}$ (VctA) $\boxed{-}$ $\boxed{\text{OPTN}}$ $\boxed{4}$ (VctB) $\boxed{\text{=}}$.

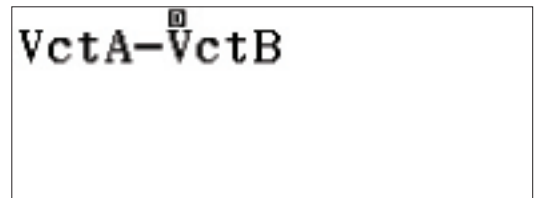


VctB=
 $\begin{bmatrix} 3 \\ -4 \\ 5 \end{bmatrix}$

5



Vector



VctA - VctB



VctAns=
 $\begin{bmatrix} -1 \\ 7 \\ -7 \end{bmatrix}$

-1

For multiplication, press

$\boxed{\text{OPTN}}$ $\boxed{3}$ (VctA) $\boxed{\times}$ $\boxed{\text{OPTN}}$ $\boxed{4}$ (VctB) $\boxed{\text{=}}$.



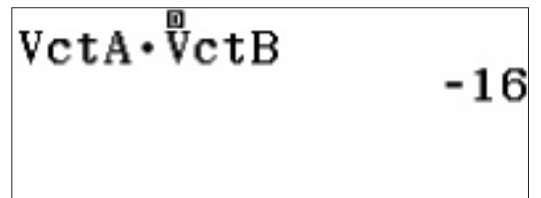
VctAns=
 $\begin{bmatrix} -16 \\ -17 \end{bmatrix}$

7

The sums of the product of the components of a vector are known as the vector's dot product. So,

$$\mathbf{u} \cdot \mathbf{v} = (2 * 3) + (3 * -4) + (-2 * 5) = -16.$$

Press $\boxed{\text{OPTN}}$ $\boxed{3}$ (VctA) $\boxed{\text{OPTN}}$ $\boxed{\blacktriangledown}$ $\boxed{2}$ (Dot Product) $\boxed{\text{OPTN}}$ $\boxed{4}$ (VctB) $\boxed{\text{=}}$.



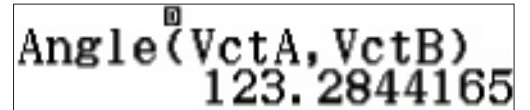
VctA * VctB

-16

VECTOR

Even some time-consuming vector operations like the angle between vectors, which is defined as $\cos^{-1} \frac{u \cdot v}{\|u\| \|v\|} = \theta$ in which $\|v\| = \|2i + 3j - 2k\| = \sqrt{2^2 + 3^2 + (-2)^2} = |v|$ are easily accomplished on the fx-991EX.

To calculate vector cross product (not vector multiplication), press **OPTN** **▼** **3** (Angle) **OPTN** **3** (VctA) **SHIFT** **)** (,) **OPTN** **4** (VctB) **)** **=**.



Angle[□](VctA, VctB)
123.2844165