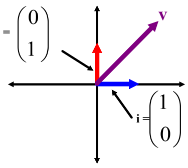
Vector Algebra in 2D - Basics

Unit Vector= Vector with a magnitude of 1

$\mathbf{j} = \begin{pmatrix}0\\1\end{pmatrix}$



$\mathbf{i} = \begin{pmatrix}1\\0\end{pmatrix}$

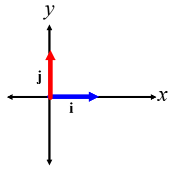
$\begin{pmatrix}1\\0\end{pmatrix}$ and $\begin{pmatrix}0\\1\end{pmatrix}$ Column vectors (Component form)

i and **j** Unit vectors

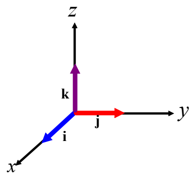
Example #1:

$\mathbf{v} = \begin{pmatrix}2\\2\end{pmatrix}$ Component form

$\mathbf{v} = 2\mathbf{i} + 2\mathbf{j}$ Linear combination of unit vectors



In 2-D space, $\mathbf{i} = \begin{pmatrix}1\\0\end{pmatrix}$, $\mathbf{j} = \begin{pmatrix}0\\1\end{pmatrix}$ and O(0, 0).



→ In 3-D space, $\mathbf{i} = \begin{pmatrix}1\\0\\0\end{pmatrix}$, $\mathbf{j} = \begin{pmatrix}0\\1\\0\end{pmatrix}$ and $\mathbf{k} = \begin{pmatrix}0\\0\\1\end{pmatrix}$

The origin O has coordinates (0, 0, 0)

Example #2

Given the points A(1,-3,1), B(3,-1,1) and O(0,0,0) ,

a.) Write the vectors $\overline{OA}$ and $\overline{OB}$ in component form.

$\vec{OA} = \begin{pmatrix}1\\-3\\1\end{pmatrix}$ $\vec{OB} = \begin{pmatrix}3\\-1\\1\end{pmatrix}$

b.) Express $\overline{AB}$ as a linear combination of unit vectors.

$\vec{AB} = \begin{pmatrix}2\\2\\0\end{pmatrix} = 2i + 2j + 0k$

Homework

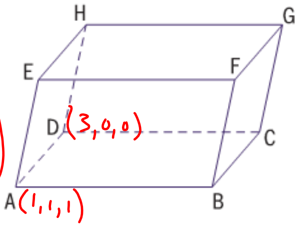
11C p.564 #1-4

3 The diagram shows a parallelepiped ABCDEFGH.

Given $\vec{OA} = \begin{pmatrix}1\\1\\1\end{pmatrix}$, $\vec{OB} = \begin{pmatrix}2\\3\\3\end{pmatrix}$, $\vec{OD} = \begin{pmatrix}3\\0\\0\end{pmatrix}$ and $\vec{OE} = \begin{pmatrix}3\\2\\-1\end{pmatrix}$

A(1,1,1)

$\vec{AD} = \begin{pmatrix}2\\-1\\-1\end{pmatrix}$



find in component form:

a $\vec{AB}$ **b** $\vec{AD}$ **c** $\vec{AE}$

d $\vec{AG}$ **e** $\vec{BD}$ **f** $\vec{BH}$