Chapter 12.2 notes

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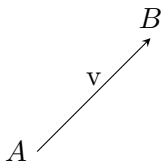
September 7, 2019

Intro to Vectors

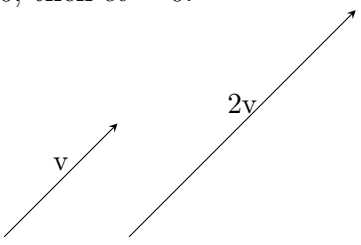
A **vector** is a quanity that has both magnitude and direction. The *magnitude* is denoted by the length of the arrow and the *direction* of the arrow indicated the vectors direction. This is denoted as such: $\vec{v}$, below is an example of an basic vector.

$\vec{v} = \vec{AB}$: 

Combining vectors

Definition of vector addition if **u** and **v** are vectors positioned so the inital point of **v** is at the terminal point of **u**, then the **sum u + v** is the vector from the inital point of **u** to the terminal point of **v**.

Definition of scalar Multiplication if c is a scalar and **v** is a vector, then the **scalar multiple of cv** is the vector whose length is $|c|$ times the length of **v** and whose directions is the same as **v** if $c > 0$ and is oppsite to **v** if $c < 0$. If $c = 0$ or $v = 0$, then $cv = 0$.

Example: 

The next part of the section is when we are given pointsand have to find the vector of the points. The following is a way to do that.
How to find the vector between two points Given the points $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$ the vector **a** with representation $\vec{AB}$ is

$\vec{a} = \langle x_2 - x_1, y_2 - y_1, z_2 - z_2 \rangle$
The length of the two-dimensional vector $\vec{a} = \langle a_1, b_1 \rangle$ is
$|\vec{a}| = \sqrt{a_1^2 + a_2^2}$
The length of the three-dimensional vector $\vec{a} = \langle a_1, a_2, a_3 \rangle$ is
$|\vec{a}| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

To add, subtract, and multiply vectors you do the following(just add 'z' for 3d vectors):
$\vec{a} + \vec{b} = \langle a_1 + b_1, a_2 + b_2 \rangle$
$\vec{a} - \vec{b} = \langle a_1 - b_1, a_2 - b_2 \rangle$
$c * \vec{a} = \langle ca_1, ca_2 \rangle$

Properties of Vectors if $\vec{a}, \vec{b}, and \vec{c}$ are vectors in V_n and c and d are scalars, then:
1.) $\vec{a} + \vec{b} = \vec{b} + \vec{a}$ 2.) $\vec{a} + (\vec{b} + \vec{c}) = (\vec{a} + \vec{b}) + \vec{c}$

3.) $\vec{a} + 0 = \vec{a}$ 4.) $\vec{a} + (-\vec{a}) = 0$

5.) $c(\vec{a} + \vec{b}) = c\vec{a} + c\vec{b}$ 6.) $(c + d)\vec{a} = c\vec{a} + d\vec{a}$

7.) $(cd)\vec{a} = c(d\vec{a})$ 8.) $1\vec{a} = \vec{a}$