# VECTORS Chapter 6 – Introduction to Vectors

(Material adapted from Chapter 6 of your text)



## **Chapter 6 – Introduction to Vectors**

Contents with suggested problems from the Nelson Textbook (Chapter 6)

- **6.1 An Introduction to Vectors** *Pg. 98 101* Pg. 279 – 281 #1, 2, 4 – 10
- **6.2 Vector Addition (and subtraction)** *Pg 102 107* Pg. 290 – 292 #1 – 14 (Ex 4 on Pg. 287 is awesome)
- 6.4 Properties of Vector Addition and Scalar Multiplication *Pg 108 111* Pg. 307 #1 – 11
- **6.5 Vectors in 2D and 3D** *Pg. 112 117* Pg. 316 – 318 #2, 3, 5 – 7, 9, 13 – 16
- **6.6 Algebraic Operations with Vectors in R^2** *Pg. 118 122* Pg. 324 – 326 #1 – 17
- 6.7 Algebraic Operations with Vectors in R<sup>3</sup> *Pg. 123 124* Pg. 332 – 333 #1 – 14
- 6.8 Linear Combinations and Spanning Sets *Pg. 125 127* Pg. 344 #1 – 4
- **6.8b Linear Combinations and Spanning Sets 2** *Pg. 128 132* Pg. 340 - 342 #1 – 6, 7, 10, 11, 8, 9, 12b, 13b, 14, 15

## **6.1 An Introduction to Vectors**

#### **Definition 6.1.1**

A vector is a mathematical object which carries two characteristics:

Geometrically we can think of (or visualize) vectors as directed line segments

#### Picture



## **Some Basic Notations**

- In general we "write" vectors (or algebraically represent vectors):
  a) With capital letters indicating the "tip" and "tail" points of the vector
  - b) With a single lower case letter



2) We write the **Magnitude** of vectors with "absolute value bars"

### (KNOW YOUR CONTEXT!)

e.g. The magnitude of  $\vec{a}$  is given by

The magnitude of  $\overrightarrow{AB}$  is

Concerning Magnitude

a) Magnitude is just a number

b) The **magnitude** of any vector is always positive (since it represents the **length** of the vector).

3) Two vectors  $\vec{a}$  and  $\vec{b}$  are said to be equal (or equivalent) if:

- a)
- b)

Pictures

4) A scalar is a (mathematical) quantity which can "scale" vectors (describing size)

Examples:

Magnitude is a

Speed is a

Velocity is a

Scalars can "stretch" or "shrink" vectors (in terms of magnitude). Scalars can be negative.

Picture:



Comment

5) If  $\vec{a} = -\vec{b}$ , then we have that

a)  $\vec{a}$  and  $\vec{b}$  are pointing in opposite directions, but

b)  $\left| \vec{a} \right| = \left| \vec{b} \right|$ 

We sometimes call  $\vec{a}$  and  $\vec{b}$ 



#### Example 6.1.2

Using a scale of 1cm = 5km/hr draw a vector which represents  $25 km / hr \left[ S60^{\circ} E \right]$ 

*Class/Homework for Section 6.1 Pg. 279 – 281 #1, 2, 4 – 10*