6.3 Notes: Introduction to Vectors in the Plane

***Vector = a directed line segment that represents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.***

 **Magnitude = size or amount of force**

**The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the vector represents its magnitude.**

The magnitude of any vector can be found by using the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Ex: Find the magnitude of $\rightharpoonaccent{PQ}$.



**Q**

**P**

**Two vectors are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when they have the same magnitude and direction.**

**Component Form of a Vector**

The directed line segment whose initial point is the \_\_\_\_\_\_\_\_\_ is often the most convenient. This vector **v** is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The component form of a vector **v**, is written as:

The component form of a vector with initial point $P(p\_{1},p\_{2})$ and terminal point $Q(q\_{1},q\_{2})$ is given by

The magnitude (or length) of **v** is given by

Ex: Show that vectors **u** and **v** are equal:

The vector **u** from P(0,0) to Q(3,2).

The vector **v** from R(1,2) to S(4,4)

Ex: Find the component form and magnitude of the vector v that has initial point $(4, -7)$ and terminal point $(-1, 5)$

YOU TRY!

Find the component form and magnitude of the vector v that has initial point $(2, 2)$ and terminal point $(-1, 4$)

**Vector Operations**

Two basic vector operations are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
| Illustration of Scalar Multiplication | Illustration of Vector Addition |

Let $u=\left〈u\_{1},u\_{2}\right〉$ and $v=\left〈v\_{1},v\_{2}\right〉$ be vectors and let *k* be a scalar (a real number), then:

|  |  |
| --- | --- |
| sum of **u** and **v** is the vector | scalar multiple of *k* times **u** is the vector |
|  negative of $v=\left〈v\_{1},v\_{2}\right〉$  | difference of **u** and **v**  |

Let $v=\left〈-2, 5\right〉 and w=\left〈3, 4\right〉$, find the each of the following vectors

|  |  |
| --- | --- |
| 1. **2v**
 |  |
| 1. $w-v$
 |  |
| 1. $v+2w$
 |  |

The letters **i** and **j** can also be used to represent a vector’s components. This is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Ex: let **u** be the vector with initial point $(2, -5)$ and terminal point$ (-1, 3$). Write **u** as a linear combination of the standard unit vectors **i** and **j**.

Ex: Let $u=-3i+8j and v=2i-j$. Find $2u-3v$

**Finding Direction Angles of Vectors**

Direction angles of vectors are measured in several different ways. Today we will measure our angles in standard form, counter-clockwise from the positive x-axis.

Find the direction angle of each of the following vectors.

**Ex:  Ex: **