# Chapter 3

Jeffrey Wubbenhorst

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- Scalars have only magnitude. Vectors have both magnitude and direction.
- Two vectors $\vec{a}$ and $\vec{b}$ may be added geometrically by drawing them to a common scale and placing them head to tail. The vector connecting the tail of the first to the head of the second is the vector sum $\vec{s}$. Vector addition is commutative and obeys the associative law.
- The components of a a two-dimensional vector $\vec{a}$ are given as $a_x = \cos\theta$ and $a_y = a\sin\theta$
- Magnitude and orientation of a vector are given as $a = \sqrt{a_x^2 + a_y^2}$ and $\tan\theta = \frac{a_y}{a_x}$
- Unit vectors $\hat{i}, \hat{j}, \hat{k}$ have magnitudes of unity and are directed in the positive directions of the $x, y,$ and $x$ axes. Unit vectors are defined as $\hat{v} \equiv \frac{v}{|v|}$
- The scalar (or dot product) of two vectors $\vec{a}$ and $\vec{b}$ is written $\vec{a}\dot{\vec{b}}$ and is the scalar quantity given by $ab\cos\theta$ where $\theta$ is the angle between the directions of $\vec{a}$ and $\vec{b}$.
- The vector (or cross) product of two vectors is a vector whose magnitude is given as $c = ab\sin\theta$. The rest of it is ugly and we do not care.
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