Homework 8 worksheet

Due November 25, 2014

1. Let $\mathbf{v}$ and $\mathbf{w}$ be vectors. Which of the following expressions make sense? A. $\mathbf{v}+\mathbf{w}$ B. $2\mathbf{v}$ C. $\mathbf{v}+2$ D. $||\mathbf{v}+\mathbf{w}||$ E. $||\mathbf{v}+\mathbf{w}||$ F. $||\mathbf{v}||/\mathbf{v}$ G. $\mathbf{v}/||\mathbf{v}||$

2. Let $\mathbf{v} = \langle 1, 1.5 \rangle$.

   (a) What's $2\mathbf{v}$?

   (b) What's $-\mathbf{v}$?

   (c) Draw arrows representing $\mathbf{v}$, $2\mathbf{v}$, and $-\mathbf{v}$.

   (d) How do the magnitude and direction of $\mathbf{v}$ relate to the magnitude and direction of $2\mathbf{v}$?

   (e) How do the magnitude and direction of $\mathbf{v}$ relate to the magnitude and direction of $-\mathbf{v}$?

3. Let $\mathbf{v} = \langle 1, 2 \rangle$

   (a) What's $||\mathbf{v}||$?

   (b) What's $\mathbf{v}/||\mathbf{v}||$?

   (c) What's the magnitude of $\mathbf{v}/||\mathbf{v}||$?

   (d) What's the magnitude of $2\mathbf{v}/||\mathbf{v}||$?

4. Let $\mathbf{w}$ be any nonzero vector. What's the magnitude of $\mathbf{w}/||\mathbf{w}||$?

5. Famed mathematician Emmy Noether once said[1] that, for any number $m \geq 0$ and any vector $\mathbf{v}$, the unit vector in the same direction as $\mathbf{v}$ is given by:

$$\frac{m\mathbf{v}}{||\mathbf{v}||}.$$

   Write a couple of sentences about why this works.

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[1] Actually, she helped invent the field of modern algebra, and proved a groundbreaking theorem stating, for instance, that energy is conserved in our universe because the laws of physics don't change with time