Wednesday Reading Assessment: Unit 0, and vectors

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1 Useful Equations

1. Displacement: $\Delta \vec{x} = \vec{x}_f - \vec{x}_i$

2. Magnitude of a vector: $|\vec{v}| = \sqrt{a^2 + b^2}$, if a and b are the x and y components, respectively.

3. Subtracting two vectors: $\vec{u} - \vec{v} = (a_u - a_v)\hat{i} + (b_u - b_v)\hat{j}$.

2 Vector Addition and Subtraction

1. Let $\vec{u} = 2\hat{i} + 2\hat{j}$ (km), and let $\vec{v} = 2\hat{i} - 2\hat{j}$ (km). Suppose $\vec{u}$ and $\vec{v}$ represent the positions of two ships at sea. Draw a diagram of the locations of the ships below.

2. How far is each ship from the origin? That is, what are the magnitudes of the ships' position vectors?

3. How far apart are the ships from each other? That is, what is the displacement between the ships?

3 Unit Conversions

1. Convert the following quantities into the given units:

   - A wind-speed of 4 kilometers per hour into meters per second.
   - A time duration of 3.1 days into seconds.
   - A wavelength of 0.0012 meters into millimeters
   - A density of 1.0 grams per centimeter-cubed into kilograms per meter cubed.