

Physics 1A Discussion (Week 1)

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Problem 1 (problem 1.39 on page 29 of the textbook)

Given two vectors $\vec{A} = -2.00\hat{i} + 3.00\hat{j} + 4.00\hat{k}$ and $\vec{B} = 3.00\hat{i} + 1.00\hat{j} - 3.00\hat{k}$, where $\hat{i}, \hat{j}, \hat{k}$ are the unit vectors

- (a) Find the magnitude of each vector.
- (b) Use unit vectors $\hat{i}, \hat{j}, \hat{k}$ to write an expression for the vector difference $\vec{A} - \vec{B}$.
- (c) Find the magnitude of the vector difference $\vec{A} - \vec{B}$.
- (d) Is this the same as the magnitude of $\vec{B} - \vec{A}$? Explain.

Problem 2(An Earthlike Planet: problem 1.51 on page 30 of the textbook)

In January 2006, astronomers reported the discovery of a planet comparable in size to the Earth, orbiting another star and having a mass about 5.5 times the Earth's mass M_{Earth} . It is believed to consist of a mixture of rock and ice, similar to Neptune. If this planet has the same density as Neptune (1.76 g/cm^3), what is its radius expressed

- (a) in km (kilometers)?
- (b) as a multiple of earth's radius R_{Earth} ?

Necessary astronomical data are the following:

$$1\text{km} = 10^3\text{m} = 10^5\text{cm}, \quad 1\text{g} = 10^{-3}\text{kg} = 0.001\text{kg}, \quad M_{\text{Earth}} = 5.97 \times 10^{24}\text{kg}, \quad R_{\text{Earth}} = 6.37 \times 10^3 \text{ km}$$

Problem 3 (problem 1.68 on page 31 of the textbook)

You live in a town where the streets are straight but are in a variety of directions. On Saturday you go from your apartment to the grocery store by driving 0.60 km due north and then 1.40 km in the direction 60.0° west of north. On Sunday, you again travel from your apartment to the same store, but this time by driving 0.80 km in the direction 50.0° north of west and then in a straight line to the store.

(a) How far is the store from your apartment?

(b) On which day do you travel the greater distance, and how much farther do you travel? Or, do you travel the same distance on each route to the store?