Name_____

Physics 120 Quiz #1, April 4, 2014

Please show all work, thoughts and/or reasoning in order to receive partial credit. The quiz is worth 10 points total.

I affirm that I have carried out my academic endeavors with full academic honesty.

_____

The position of an object is given by $\vec{r} =< 2,-8,-6 > m$, where with respect to an origin of a coordinate system that is located at $< 0,0,0 > m$.

a. What is the distance from the origin to the location of the object?

The distance is the magnitude of the position vector. We have
$r = |\vec{r}| = \sqrt{r_x^2 + r_y^2 + r_z^2} = \sqrt{(2)^2 + (-8)^2 + (-6)^2}\, m = 10.2m$.

b. What is the unit vector in the direction of $\vec{r}$?

The unit vector is given by $\hat{r} = \frac{\vec{r}}{r} = \left\langle \frac{2}{10.2}, \frac{-8}{10.2}, \frac{-6}{10.2} \right\rangle = \langle 0.196, -0.784, -0.588 \rangle$.

c. What are the angles that each component of $\vec{r}$ makes with respect to their respective coordinate axes?

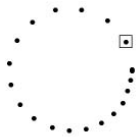
$\hat{r} = \langle \cos\alpha, \cos\beta, \cos\gamma \rangle = \langle 0.196, -0.784, -0.588 \rangle$

$\cos\alpha = 0.196 \rightarrow \alpha = 78.7^0$

$\cos\beta = -0.784 \rightarrow \beta = 141.6^0$

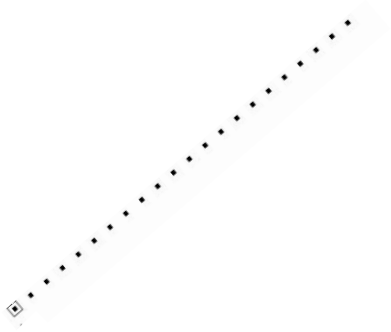
$\cos\gamma = -0.588 \rightarrow \gamma = 123.9^0$

d. Given the diagrams below, which diagram(s) if any, show an object that is undergoing an interaction?

a. 

b.

c.

d. 

e. For each of your choices in part d, what evidence can you cite to support the fact that the object is undergoing an interaction?

For choice A, the direction of the object is changing in time.

For choice B, the spacing between the dots is changing with time. This is the magnitude of the displacement vector.

Physics 120 Equation Sheet

Vectors

$\vec{r} = < r_x, r_y, r_z > = |\vec{r}| \cdot \hat{r}$

magnitude of a vector : $r = |\vec{r}| = \sqrt{r_x^2 + r_y^2 + r_z^2}$

unit vector : $\hat{r} = \dfrac{\vec{r}}{|\vec{r}|}$