Name_____
Physics 120 Quiz #1, April 1, 2011

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

1. Suppose that an object is moving around the circumference of a circle of radius *r* and that one time around the circumference of this circle takes a time *t* seconds. If the speed *v* of the particle ($v = \frac{2\pi r}{t}$) is constant, which of the following is true.
   a. The object is experiencing an interaction because the speed is changing.
   b. The object is experiencing an interaction because its direction is changing.
   c. The object is experiencing an interaction because its speed and its direction are changing.
   d. The object is experiencing no interactions because its speed is constant.
   e. The object is experiencing no interactions because its speed is constant and its direction is not changing.

2. An electron is located at a point $\langle 4\times10^{-10}, -7\times10^{-10}, 0\rangle m$ in a standard Cartesian coordinate system.

   a. What is $|\vec{r}|$?

$$|\vec{r}| = \sqrt{r_x^2 + r_y^2 + r_z^2} = \sqrt{\left(4\times10^{-10}m\right)^2 + \left(-7\times10^{-10}m\right)^2 + \left(0\times10^{-10}m\right)^2} = 8.1\times10^{-10}m$$

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

$$\hat{r} = \frac{\vec{r}}{|\vec{r}|} = \frac{\langle 4,-7,0\rangle \times 10^{-10}m}{8.1\times10^{-10}m} = \langle 0.49,-0.89,0\rangle$$

   c. What is the angle, θ_1, between the *x-axis* and the vector $\hat{r}$?

$$\hat{r} = \langle \hat{r}_x, \hat{r}_y, \hat{r}_z\rangle = \langle \cos\theta_1, \cos\theta_2, \cos\theta_3\rangle = \langle 0.49,-0.89,0\rangle$$

$$\therefore \cos\theta_1 = 0.49 \rightarrow \theta_1 = 60.7^o$$

Useful formulas:

Geometry /Algebra

Circles	*Triangles*	*Spheres*
$C = 2\pi r$	$A = \frac{1}{2}bh$	$A = 4\pi r^2$
$A = \pi r^2$		$V = \frac{4}{3}\pi r^3$

Quadratic equation: $ax^2 + bx + c = 0,$

whose solutions are given by: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Vectors

magnitude of a vector: $|\vec{a}| = \sqrt{a_x^2 + a_y^2 + a_z^2}$

writing a vector: $\vec{a} = \langle a_x, a_y, a_z \rangle = |\vec{a}|\hat{a} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$