Physics 5300, Theoretical Mechanics Spring 2015

Quiz 1

Given: Friday Jan 16

Problem 1 A particle moves in a circle (center O and radius R) with constant angular velocity ω counterclockwiswe:

$$\vec{r}(t) = R\cos(\omega t)\hat{x} + R\sin(\omega t)\hat{y}$$

Find

(i) The velocity at time t. (2 points)

(ii) The acceleration at time t. (2 points)

(iii) What is the magnitude and direction of the acceleration? (describe in any way you like, but the result should be clear). (2 points)

Problem 2 The unit vector $\hat{r}$ in 2-d polar coordinates is equal to

$$\hat{r} = \cos\phi\,\hat{x} + \sin\phi\,\hat{y}$$

Find the corresponding expresson for the unit vector $\hat{\phi}$. (4 points)