

**Vector Functions and Curves**  
*One variable functions*

**Question**

Given that the position and velocity vectors of a moving object are always perpendicular, show that the objects' path lies on a sphere.

**Answer**

$$\frac{d}{dt}|\underline{r}|^2 = \frac{d}{dt}\underline{r} \bullet \underline{r} = 2\underline{r} \bullet \underline{v} = 0$$

$\Rightarrow |\underline{r}|$  is constant.

Hence  $\underline{r}(t)$  lies on a sphere which is centered at the origin.