

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

**Question**

Find the velocity, speed and acceleration of the particle with position given by  $\underline{r}(t)$  at time  $t$ . Also determine the particles path.

$$\underline{r} = a \cos t \underline{i} + a \sin t \underline{j} + ct \underline{k}$$

**Answer**

Position:  $\underline{r} = a \cos t \underline{i} + a \sin t \underline{j} + ct \underline{k}$

Velocity:  $\underline{v} = -a \sin t \underline{i} + a \cos t \underline{j} + c \underline{k}$

Speed:  $v = \sqrt{a^2 + c^2}$

Acceleration:  $\underline{a} = -a \cos t \underline{i} - a \sin t \underline{j}$

Path: a circular helix.