

**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.

$$\underline{r} = t^2 \underline{i} - t^2 \underline{j} + \underline{k}$$

**Answer**

Position:  $\underline{r} = t^2 \underline{i} - t^2 \underline{j} + \underline{k}$

Velocity:  $\underline{v} = 2t \underline{i} - 2t \underline{j}$

Speed:  $v = 2\sqrt{2}t$

Acceleration:  $\underline{a} = 2 \underline{i} - 2 \underline{j}$

Path: the half-line  $x = -y \geq 0, z = 1$ .