

Problem 4.5

a.) Determine the velocity function:

$$\begin{aligned}\vec{v}(t) &= \frac{d\vec{r}}{dt} \\ &= \frac{d(3\hat{i} - 6t^2\hat{j})}{dt} \\ &= -(12t \text{ m/s}) \hat{j}\end{aligned}$$

b.) Determine the acceleration function:

$$\begin{aligned}\vec{a}(t) &= \frac{d\vec{v}}{dt} \\ &= \frac{d(-12t \hat{j})}{dt} \\ &= -(12 \text{ m/s}^2) \hat{j}\end{aligned}$$

c.) At $t = 1$ second:

$$\begin{aligned}\vec{r}(t = 1) &= 3\hat{i} - 6t^2\hat{j} \\ &= 3\hat{i} - 6(1 \text{ s})^2\hat{j} \\ &= (3\hat{i} - 6\hat{j})\text{m}\end{aligned}$$

$$\begin{aligned}\vec{v}(t = 1) &= -12t\hat{j} \\ &= -12(1 \text{ s})\hat{j} \\ &= -(12\hat{j}) \text{ m/s}\end{aligned}$$