Problem 4.3

$$x(t) = 18t \text{ and } y(t) = 4t - 4.9t^2$$

a.) position vector:

$$\bar{r}(t) = (18t)\hat{i} + \left(4t - 4.9t^2\right)\hat{j}$$

b.) velocity function:

$$\vec{v}(t) = \frac{d\vec{r}}{dt}$$

$$= \frac{d\left[(18t)\hat{i} + \left(4t - 4.9t^2\right)\hat{j}\right]}{dt}$$

$$= \left[18\hat{i} + (4 - 9.8t)\hat{j}\right](m/s)$$

$$x(t) = 18t \text{ and } y(t) = 4t - 4.9t^2$$

c.) acceleration function:

$$\begin{aligned}\vec{a}(t) &= \frac{d\vec{v}}{dt} \\ &= \frac{d\left[18\hat{i} + (4 - 9.8t)\hat{j}\right]}{dt} \\ &= \left(-9.8 \text{ m/s}^2\right)\hat{j}\end{aligned}$$

d.) at t = 3 seconds:

$$\begin{aligned}\vec{r}(t) &= (18t)\hat{i} + \left(4t - 4.9t^2\right)\hat{j} \\ &= (18(3))\hat{i} + \left(4(3) - 4.9(3)^2\right)\hat{j} \\ &= \left[54\hat{i} - 32.1\hat{j}\right] \text{meters}\end{aligned}$$

$$\vec{a}(t) = \left(-9.8 \text{ m/s}^2\right)\hat{j}$$

$$\begin{aligned}\vec{v}(t) &= \left[18\hat{i} + (4 - 9.8t)\hat{j}\right] \\ &= \left[18\hat{i} + (4 - 9.8(3))\hat{j}\right] \\ &= \left[18\hat{i} - 25.4\hat{j}\right] (\text{m/s})\end{aligned}$$