P3.2-1) The velocity of a particle is given by $\mathbf{v} = 4t^2\mathbf{i} + 3t\mathbf{j}$ m/s, where t is in seconds. At t = 0 seconds the particle's position is $\mathbf{r} = 2\mathbf{i} - \mathbf{j}$ m. Determine the particle's position at t = 2 seconds. Also, determine the magnitude and direction of the particle's acceleration at t = 2 seconds.

Given:

Find:

Solution:

Derive the particle's position as a function of time.

Circle the equation that you will use?

$\int \mathbf{v}(t)\, dt = \int d\mathbf{r}$ $\int \mathbf{a}(t)\, dt = \int d\mathbf{v}$

$\int \mathbf{a}(\mathbf{r})\, d\mathbf{r} = \int \mathbf{v}\, d\mathbf{v}$

What are your limits of integration? Remember, it is good practice to leave the upper limit a variable.

$\mathbf{r}(t)$ = ______________________________

Calculate the particle's position at 2 seconds.

$\mathbf{r}_{t=2}$ = ______________________________

Derive the particle's acceleration as a function of time.

Circle the equation that you will use?

$\mathbf{v} = \frac{d\mathbf{r}}{dt}$ $\mathbf{a} = \frac{d\mathbf{v}}{dt}$ $\mathbf{a}\, d\mathbf{r} = \mathbf{v}\, d\mathbf{v}$

$\mathbf{a}(t)$ = ______________________________

Calculate the particle's acceleration at 2 seconds.

$\mathbf{a}_{t=2}$ = ______________________________

Calculate the magnitude and direction of the particle's acceleration at 2 seconds.

$a_{t=2}$ = ______________ θ = ___________