

## 8D Differentiating Vectors

1. A particle  $P$  of mass  $0.8\text{kg}$  is acted on by a single force  $\mathbf{F}\text{ N}$ . Relative to a fixed origin  $O$ , the position vector of  $P$  at time  $t$  seconds is  $\mathbf{r}$  metres, where:

$$\mathbf{r} = 2t^3\mathbf{i} + 50t^{\frac{1}{2}}\mathbf{j}, \quad t \geq 0$$

Find:

- a) The speed of  $P$  when  $t = 4$
- b) The acceleration of  $P$  as a vector when  $t = 2$

c) The value of  $F$  when  $t = 2$