**Differentiating Vectors**

We use calculus with 2-d (and 3-d) vectors by differentiating and integrating each function of time separately:

 If $r=xi+yj$, then

**Example**

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

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

Find:

1. the speed of $P$ when $t=4$
2. the acceleration of $P$ as a vector when $t=2$
3. $F$ when $t=2$.

Exercise 8D Page 171