**8E Integrating Vectors**

1. A particle $P$ is moving in a plane. At time $t$ seconds, its velocity, $vms^{-1}$, is given by:

$$v=3ti+\frac{1}{2}t^{2}j$$

When $t=0$, the position vector of $P$ with respect to a fixed origin $O$ is $(2i – 3j) m$. Find the position vector of $P$ at time $t$ seconds

1. A particle $P$ is moving in a plane so that, at time $t$ seconds, its acceleration is:

$$a=\left(4i-2tj\right)ms^{-2}$$

At $t=3$, the velocity of $P$ is $6i ms^{-1}$ and the position vector of $P$ is $\left(20i+3j\right) m $with respect to a fixed origin $O$. Find:

1. The angle between the direction of motion of $P$, and $i$, when $t=2$
2. The distance of $P$ from $O$ when $t=0$
3. The velocity of a particle at time $t$ seconds is given by:

$$v=\left(3t^{2}-8\right)i+5j$$

When $t=0$, the position vector of $P$ with respect to a fixed origin is $\left(2i – 4j\right) m$

1. Find the position vector of $P$ after $t$ seconds

A second particle $Q$ moves with constant velocity $\left(8i + 4j\right) ms^{-1}$. When $t = 0$, the position vector of Q with respect to the origin $O$ is $2i$ $m$.

b) Prove that $P$ and $Q$ collide