**8B Simple Harmonic Motion**



$\ddot{x}=-w^{2}x$

$$v^{2}=w^{2}\left(a^{2}-x^{2}\right)$$

$x=asin\left(wt+C \right)$







$$Period=\frac{2π}{w}$$

1. A particle is moving along a straight line. At time $t$ seconds its displacement, $x m$ from a fixed point $O$ is such that:

$$\frac{d^{2}x}{dt^{2}}=-4x$$

Given that at $t=0$, $x=1$ and that the particle is moving with velocity $4 ms^{-1}$:

1. Find an expression for the particle’s displacement after $t$ seconds
2. Determine the maximum displacement of the particle from $O$.
3. A particle $P$ is attached to the ends of two identical elastic springs. The free ends of the springs are attached to two points $A$ and $B$. The point $C$ lies between $A$ and $B$ such that $ABC$ is a straight line and $AB\ne BC$. The particle is held at $C$ and then released from rest.

At time $t$ seconds, the displacement of the particle from $C$ is $x m$ and its velocity is $v ms^{-1}$. The subsequent motion can be described by the differential equation $\ddot{x}=-25x$.

1. Describe the motion of the particle
2. Given that when $t=0$, $x=0.4 $and $v=0$, find $x$ as a function of $t$
3. State the period of the motion and state the maximum speed of $P$.