Kinematic

Displacement $s(t)$
Velocity $v(t) = s'(t)$
Acceleration $a(t) = v'(t)$

Key words

At rest or change direction: $v(t) = 0$
Constant velocity: $a(t) = 0$

$v(t)$	**Meaning**
= 0	At rest
> 0	Moving to the right
< 0	Moving to the left

1. A particle moves in a straight line with position given by $s(t) = t^3 - 3t + 1$, where t is the time in seconds, $t \geq 0$. Find the velocity of the particle at $t = 1$.

2. The velocity v ms^{-1} of a particle after t seconds is given by v(t) = $(0.1t + 0.5)^2 - 4$. Find the value of t when the acceleration is 0.9.

Paper 1

1. In this question, you are given that $cos\frac{\pi}{3} = \frac{1}{2}$ and $sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$.
The displacement of an object from a fixed point, O is given by $s(t) = t - \sin 2t$ for $0 \leq t \leq \pi$.

(a) Find $s'(t)$.
In this interval, there are only two values of t for which the object is not moving. One value is $t = \frac{\pi}{6}$.

(b) Find the other value.
(c) Show that $s'(t) > 0$ between these two values of t.
(d) Find the distance travelled between these two values of t.

Paper 2

1. The population of deer in an enclosed game reserve is modelled by the function $P(t) = 210 \sin(0.5t - 2.6) + 990$, where t is in months, and t = 1 corresponds to 1 January 2014.

(a) Find the number of deer in the reserve on 1 May 2014.

(b) (i) Find the rate of the deer population on 1 May 2014.

(ii) Interpret the answer to part (i) with reference to the deer population size on 1 May 2014.