**Maxima and Minima Problems**

Recall from Pure that at minimum/maximum points, the gradient is 0. We could therefore for example find where the velocity is minimum/maximum by finding when $\frac{dv}{dt}=0$ (i.e. when the acceleration is 0). Similarly, we can find the maximum and minimum values for displacement and acceleration.

**Example**

A particle P, moves in a straight line such that its velocity, $v ms^{-1}$ at time $t s$, is given by:

$v = 5 - 9t + 6t^{2} - t^{3}$ where $0\leq t\leq 4$

a) Find the difference between the maximum and minimum velocities over this time interval

b) Sketch a velocity-time graph for the motion of P

c) Find the maximum acceleration over this time interval

**Test Your Understanding**

A dolphin escapes from Seaworld and its velocity as it speeds away from the park, is

$t^{3}-9t^{2}-48t+500$ (in ms-1), until it reaches its maximum velocity, and then subsequently remains at this velocity.

1. When does the dolphin reach its maximum velocity?
2. What is this maximum velocity?

**Test Your Understanding** *(EdExcel M2 June 2013 Q3a and b)*



**Test Your Understanding**

A particle P, moves in a straight line. After t seconds, its distance, s m from its starting point A, when t = 0, is given by:

$s = 2t^{3} - 9t^{2} + 12t $ where $t\geq 0$

a) Show that the particle never returns to its starting point

b) Find the distances from A at which the particle is instantaneously at rest

c) Find the acceleration of the particle at time t = 3s

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