Variable acceleration

Gold

An object is released from rest at the surface of oil and at time t seconds. Its depth, s metres is given by:

$$s = 3t^2 - 4t^3,\ 0 \leq t \leq 0.75$$

a Show that the object returns to the surface of the oil after $t = \frac{3}{4}$ s.

b Using a graph, explain the restriction $0 \leq t \leq 0.75$.

c Find the greatest depth reached by the object.

Silver

A particle P, having mass 2 kg, moves in a straight horizontal line from a fixed point O.
The velocity of the particle v m s^{-1} at time t seconds is given by:

$$v = 2t^2 - 2t - 12$$

a Find the time when particle P is instantaneous at rest.

b Find the acceleration of the particle at t =1 s.

c Given that the particle passes through O when t = 2 s, find an expression for the displacement of the particle from O at time t s.

Bronze

A particle moves in a straight line and at time, t, seconds. It has velocity v m s^{-1}, where:

$$v = 12t^2 - 4t + 3$$

a

i Find an expression for the acceleration of the particle at time, t.

ii Find the acceleration of the particle when t = 1 second.

b When t = 0 s, the particle is at the origin. Find an expression for the displacement of the particle from the origin at time, t.

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