

Answer on Question #54998, Physics – Mechanics | Kinematics | Dynamics

The position of an object as a function of time is given by $x = bt^4$, where b is a constant. Find an expression for the instantaneous velocity as a function of time, and show that the average velocity over the interval from $t = 0$ to any time t is one-fourth of the instantaneous velocity at t.

Solution:

The derivative of a distance function represents instantaneous velocity at a particular time. Thus,

$$v(t) = \frac{dx}{dt} = 4bt^3$$

Algebraically an **average velocity** is defined as,

$$\bar{v} = \frac{d}{t} = \frac{x(t) - x(0)}{t - 0}$$

where, d is the displacement and t is the time taken for that displacement.

$$\bar{v} = \frac{bt^4 - 0}{t - 0} = bt^3$$

which is just 1/4 of $v(t)$ from above.