Answer on Question#41348, Physics, Mechanics

The position of a particle along the x-axis depends on the time according to the equation according to the $at^2 - bt^3$, where x is in metres and t in seconds. What are the dimensions of and units of a and b?

a. LT^{-2},m/s^2; LT^{-3},m/s^3

b. LT^2, m/s^{-2}; LT^3, m/s^{-3}

c. $L^{-1}T^{-2}$, m^{-1}/s^2; LT^{-3}, m/s^3

d. LT^{-2}, m/s^2; $L^{-2}T^{-3}$, m^{-2}/s^3

Solution:

Given:

$$x = at^2 - bt^3$$

In this equation *x* is a distance. The unit of x is length (L) in meters (m).

So both terms being substracted, at^2 and bt^3, have the units of length.

Since at^2 has units of L, since you get L by multiplying a by a time squared (T^2), then a must have units of L/T^2 or m/s^2 (LT^{-2}).

We can do similar reasoning for bt^3. We get L out by multiplying b by a time cubed. So *b* has to have units of L divided by time^3.

Thus *b* dimension is LT^{-3},m/s^3.

Answer. a. LT^{-2},m/s^2; LT^{-3},m/s^3 .